This Book
is affectionately dedicated to
MY FATHER
whose great knowledge of medical science
and devotion to his practice has been my
chief inspiration

FOREWORD

Doctor Venugopal has written a splendid book on the Principles and Practice in the management of Surgical Patients.

The first nine chapters are devoted to general principles while the remaining 31 chapters cover the surgery of most of the organ systems as well as infections, burns, laboratory procedures and radiological investigations.

In covering such a large field the author has been limited to presentations of "Hard Core" material. This has great advantages for the medical student or the resident in training or the busy surgeon in practice who may lack the time in critical judgment to select from larger and broader discussions.

The author is to be commended for his soundness of approach, and for his clarity of presentation.

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PREFACE

The remarkable advances made in the field of medical science have contributed a great deal to make surgery safe for the patient if proper care and attention were bestowed on the details in the management of such cases. In the words of Lord Moynihan, "surgery has been made safe for the patient; we must now make the patient safe for surgery." This motto involves and necessitates close attention to every minute detail in bringing the patient to a safe level for surgical interference and in the care taken during the post-operative and convalescent periods. The great advances in anaesthesia have contributed not a little to the confidence with which the surgeon undertakes major and radical surgery. Other recent advances such as the use of antibiotics, chemotherapeutic agents, and blood transfusion have helped to inspire confidence both in the patient and in the surgeon, so that an assurance may be given of the end results of a major surgical procedure.

Important as these great advances have been and dramatic as have been the results from the use of such modern aids, one cannot but emphasize the necessity for certain fundamental principles being adopted in every case. Asepsis and antisepsis, haematological examination, a careful examination of the patient's system together with a thorough investigation of the blood chemistry and the excretory functions can never be ignored. Apart from the technique of the operation, much of the success of a surgeon depends upon the care with which the patient is nursed after operation and during the convalescent period under his instructions by the team. This is particularly important in the case of patients who are either ignorant or do not easily submit themselves to the discipline so essential in the after-treatment of surgical cases. This text-book is devoted to a detailed consideration of these many problems.

CONTENTS

This book represents the personal experiences of the author during a period of over 15 years working in a very large surgical unit with unique opportunities of observing and dealing with a variety of cases in various stages of disease. Opportunity has also been availed of, in presenting in this book certain modern topics of interest to surgeons. Special chapters have been included dealing with such important subjects as blood transfusion, fluid balance, anaesthesia, operating room techniques, radiological investigations, laboratory procedures and certain fundamental norms which every house-surgeon or post-graduate should be familiar with The advances in the field of medicine are so rapid that it is hard to keep pace in a text-book with all the new theories and treatments that may be suggested. It has been however the endeavour of the author to give in broad outline certain basic facts connected with some of these newer trends in medicine and surgery such as the use of radio-isotopes and chemotherapy in malignant diseases which are dealt with in the appendices. In the preparation of this book, I have had necessarily to consult many excellent text-books and journals and a complete bibliography of such books consulted, is given in the appendix.

I shall be failing in my duty if I do not express my sincere thanks to my colleagues in the Hospital and to the nursing staff working with me for valuable suggestions To my assistants, Drs O Devaraj, V. Ranganathan and A Umapathi, I wish to express my thanks for the help given. I wish also to acknowledge the help given by Mr Dakshinamurthi whose careful transcription of the work ensured its proper publication I thank Mr. M R Jambulingam, Artist, for the skill and patience with which he has drawn the illustrations

To the publishers, G S Press, I am very much indebted for the care taken in bringing out this book.

It is my hope that this work will be a stimulus for good surgical care by all those interested in the practice of surgery

Madras
25th October, 1958

A. VENUGOPAL MUDALIAR

PART I

CHAPTER 1

PRE-OPERATIVE CARE

The preparation of patients for operation is now recognised as a matter of the greatest importance. Lord Moynihann's greatest dictum, "Surgery has been made safe for the patient; *let us now make the patient safe for surgery*", should always be remembered by surgeons. If this is not remembered and hasty decisions are taken to operate on them, unfortunate results are likely to follow. One reason for this *hasty decision for operation is the limitation of hospital* accommodation; Another is the repeated requests by the patients' relatives to have it done as early as possible.

There are a number of factors which play a part in the pre-operative preparation of patients. The influence of age on the question of surgical intervention is sometimes great. Both the very young and the very old recover well after the operation, if proper preparation has been made. Before operation, any nutritional deficiencies or disturbance *in the acid base balance or dehydration must be corrected.* Infection must be prevented or controlled and the general health of the patient must be improved to get a satisfactory result. A check-up of the heart, lungs, kidneys and liver should be a routine before submitting patients for operation. Thus special tests and studies are absolutely essential so that proper remedial methods can be adopted before a surgical ordeal. If the patient has anaemia or diabetes, this needs correction and careful selection of anaesthesia must be considered so that no unnecessary risk is incurred.

The subject of pre-operative care has been discussed in a more detailed manner in succeeding chapters.

There are two broad groups of surgical patients, those who are poor risks and those who are good risks. But just

The electrolyte and acid base balance in the blood should be determined before correcting them. Many fluids have been devised and are commercially obtainable to meet various therapeutic needs.

Before selecting the solution, the fluid needs must also be determined and considered in calculating the total volume needed.

(a) Isotonic solution (Isotonic Sodium Chloride solution) is most widely used to replace lost base (Sodium ion) and Chlorides.

(b) Hypotonic solution to replace lost base (Sodium) and Chloride and to allow excess water for metabolic needs.

(c) Hypertonic solution, 3% or 5% to replace Sodium and Chloride in the treatment of low Sodium concentration.

(d) Sodium lactate solution to replace Sodium without added an-ion in cases of acidosis.

(e) Dilute potassium solution given in 5% glucose solution to replace the lost potassium.

It is most important to exercise great care in administration of these intravenous solutions since these alter extracellular fluid concentrations rapidly. This is specially true when giving potassium and magnesium salts which are exceedingly toxic. This subject is discussed at length in the chapter on Fluid Balance. The success of surgery to-day depends upon how well the patient's electrolyte balance is corrected before operation.

Hypovitaminosis

Many of the surgical patients have Vitamin deficiency and this can be corrected by giving the Vitamins A, B, C, D and K either in the form of injections or orally in the form of tablets. Vitamin B complex injections or tablets should be given daily so as to correct the deficiency. Vitamin C is absolutely essential for proper healing of wounds and it is found that wound disruption is more likely to occur in patients with such a deficiency. Intramuscular injections of Vitamin C

because a patient is a good risk, there is no reason for neglecting the pre-operative treatment which would render him perfectly safe for surgery. There are many conditions which operate on poor risk patients:—

Anaemia

This has got an important bearing on operation and should be treated beforehand. The Hb percentage should be raised by one or two blood transfusions and by giving the patient daily iron and liver extract by injections or orally. Before any major operation, it is wise to determine the blood group in advance and to have enough blood from the blood bank to combat the blood loss that occurs during the operation.

Fluid balance

Dehydration and electrolyte imbalance in the patient should be corrected before submitting the patient to surgery. The daily water requirement of surgical patients, according to Coller and Maddock, is 2,500 c.c.

Method of excretion or loss.	Volume of water excreted per day.
1. Imperceptible loss (Lungs and skin)	.. 1000 c c.
2. Through stools	.. 200 c.c.
3. " sweat	.. 300 c c.
4. Urine	.. 1000 c c.
Total	.. 2500 c.c.

When the patient is dehydrated, the water balance can be corrected by giving fluids through the oral route or parenteral route. The administration of fluids per rectum in the form of water or 2% glucose in water is now rarely employed since absorption of fluids by this route is uncertain.

tion improves remarkably when he is placed on a high protein diet.

(5) Protein deficiency also occurs after severe burns or haemorrhage. These patients loose a lot of serum and not only become hypoproteinaemic but also anaemic. Plasma or blood transfusion is an excellent method of replenishing the loss.

Patients with pyloric stenosis or carcinoma of the stomach, achalasia cardia, diarrhoea or dysentery develop hypoproteinaemia due to failure of absorption of protein from the diet. Patients who are having hyperthyroidism require a lot of proteins and if the diet is lacking in it, they also go into a state of protein deficiency.

A careful examination of the patient, the history of his condition and his weight together with the blood chemistry studies like the total serum proteins, albumin and globulin will give a fair index of the hypoproteinaemia. The normal plasma proteins range from 6.5 to 7.5 G/100 c.c. albumin being 3.8 to 4.4 G/100 c.c. and Globulin 2.2 to 3.4 G/100 c.c. The minimum daily requirement of protein in health is 0.6 G/KG body-weight. A high protein diet therefore should contain 120 G of protein per day and this can be supplied to the patient either orally or parenterally.

The following diet should be prescribed for patients who are hypoproteinaemic—milk, eggs, lean meat, liver, cereals, soya beans, pea-nut and flour containing a high percentage of protein (and such articles should be present in the diet of hypoproteinæmic patients).Varco recommends skimmed milk powder which contains proteins, carbo-hydrates, fats and aminoacids like Methionine for plasma protein regeneration. The most rapid and effective method of treating protein deficiency in surgical patients is to give either a blood transfusion or plasma transfusion One litre of plasma contains about 60 G of protein and this, if given pre-operatively, quickly raises the plasma protein to the normal level. There are other protein hydrolysate preparations now available like

in doses of 300 to 500 mgms daily may raise the Vitamin C content in the body quickly before the operation is done. Vitamins D and E are given to patients in the form of Cod-Liver oil or in capsules so as to bring about a quick healing of fractures. Vitamin K deficiency is determined by finding out the prothrombin time. This Vitamin is given either orally or parenterally.

Infection

All foci of infection, whether in the teeth, tonsils, adenoids, respiratory tract or genito-urinary system, must be attended to before surgery is undertaken. The patient is then operated under an umbrella of antibiotics.

Protein deficiency (Hypoproteinaemia)

Nutritional disorder in patients admitted in the surgical wards is quite common and this must be corrected to ensure a smooth post-operative convalescence. Malnutrition is the most challenging pre-operative problem to-day and one who walks into surgical wards may find his patients having anaemia, hypoproteinæmia and hypovitaminosis. These conditions may influence the choice of surgical procedure or may contraindicate any surgical intervention.

Hypoproteinaemia: The correction of protein deficiency is of major importance and if it is not done, wound healing will *not* be by *first intention*. Shock will *proportionately* be high after operation and infection is likely to take place and prevent satisfactory results. The hypoproteinæmia may occur due to the following causes:—

(1) Inadequate diet;

(2) Impaired digestion;

(3) Loss of nourishment due to intestinal or duodenal fistula;

(4) Liver disease.

In certain cases of portal cirrhosis, a severe degree of protein deficiency may be present; the patient's condi-

CHAPTER 2

GENERAL POST-OPERATIVE CARE

The immediate post-operative complications that are met with in general practice are shock and haemorrhage which should be attended to along the lines referred to elsewhere.

The post-operative treatment for some of the complications that are encountered in upper abdominal surgery and thoracic surgery are as follows:—

Respiratory complications

Atelectasis is an important complication that is met with following abdominal and thoracic surgery. This occurs as a result of blocking of the bronchi or bronchioles with mucus either due to excessive secretions following general anaesthesia or it may be due to aspiration of secretions in the throat. Thus, a partial or a complete collapse of lung might occur which is usually mistaken as pneumonia in the post-operative period. This particular complication is likely to occur even after spinal anaesthesia when it is most probably due to a hypoventilation. Physical examination would reveal:—

(i) Diminished movement of chest on the affected side or complete immobility if there is a massive collapse,

(ii) severe dyspnoea;

(iv) sudden rise in the pulse rate;

(iii) cyanosis;

(v) pain in the chest;

(vi) rapid onset of fever.

The symptoms may clear up immediately if the plug of mucus is coughed out. Examination of the patient will reveal the following physical findings:—

1. Displacement of the heart and trachea towards the affected side;

Amigen, Parenamine 5%, which can be given parenterally to restore the plasma protein level.

Post-operatively, when the patient is having intravenous fluids for first 3 or 4 days, the plasma proteins fall down to a low level and the patient may develop oedema of the feet and face. The best method to check this fall in plasma protein is to give a plasma transfusion

When patients are operated with protein deficiency, the following complications are likely to occur in the post-operative period :—

(1) Defective healing of wounds or wound disruption,

(2) Infection,

(3) Defective gastro-intestinal *motility* These patients develop a mild degree of paralytic ileus due to protein deficiency. After an intestinal anastamosis, the condition of paralytic ileus becomes aggravated due to oedema of the bowel wall which has occurred due to protein deficiency Thus the oedema round about the stoma which usually occurs after anastamosis and the oedema of the bowel wall due to hypoproteinaemia and infection may increase and thus precipitate a complete obstruction at the site of the anastamosis Operations like a simple gastro-jejunostomy for duodenal obstruction may become a failure if the hypoproteinaemia is not corrected before operation A high protein diet and protein hydrolysate preparations given orally before operation might have corrected the protein deficiency in these patients. If the protein hydrolysate cannot be absorbed through the oral route, intravenous protein hydrolysate preparations or blood or plasma transfusions may be given to raise the plasma proteins to normal level.

The preparation of the patient for operation has been dealt with in the respective chapters.

The pre-operative preparation of the bowels and the pre-anaesthetic medication have also been mentioned in each chapter.

3. Inhalation of carbon dioxide for 5 minutes every hour with oxygen for the first 24 hours and thereafter every 2 hours or 3 hours for the next three days of the post-operative period.

4. The patient must be encouraged to cough so that he can get rid of the bronchial secretions.

If atelectasis has developed:

1. Foot of the bed should be raised and the patient should lie on the unaffected side in order to promote free drainage of the bronchial secretions.

2. Carbon-dioxide inhalations for 5 minutes every hour with continuous oxygen inhalation through a nasal catheter.

3. Ammonium chloride in 5 gr. dosage four times a day is the drug of choice.

4. Tr. Benzoin inhalations are sometimes effective.

5. Morphia should be restricted in these cases as it diminishes the cough reflex and lowers the respiratory rate.

In severe cases of dyspnoea and cyanosis, an oxygen tent should be used.

In patients who fail to respond by these methods and if x-ray examination indicates a massive atelectasis, bronchoscopic aspiration is indicated.

If the patient is not treated immediately, he may imperceptibly pass on to a condition known as post-operative pneumonia. Antibiotics or chemotherapeutic drugs are indicated to control infection.

Post-operative Tracheitis

This is a complication that is likely to occur after a thyroidectomy. In some cases, it has occurred after endotracheal anaesthesia. The patient's main complaint is hoarseness of voice, cough and tenacious mucus. This condition usually responds readily to treatment. Inhalation of steam is done through a Nelson's inhaler to which a drachm of Tr. Benzoin is added to a pint of boiling water. Linctus codeine

2. absence of breath sounds, and percussion note reveals dullness;

3. x-ray of chest confirms the clinical findings.

The prevention of this important post-operative complication consists in treatment of any infections in the upper part of the respiratory tract, proper oral hygiene, clearing up of any infections in the nasal sinuses and improvement in the general condition. Thus, by eliminating infection and improving the general condition of the patient, one can lessen the post-operative shock and prevent excessive bronchial secretions.

An x-ray examination of the chest should be done in every case of laporotomy and this is particularly essential where bronchiectasis or pulmonary tuberculosis is suspected.

A large amount of thick bronchial secretion might occur during the operation. This should be taken note of by the anaesthetist and suitable medication should be adopted to prevent it. The use of atropine to reduce bronchial secretion is an advantage but the sticky bronchial secretion that might occur prevents the patient from getting rid of it and therefore may help in slighter degrees of atelectasis in the post-operative period.

During the operation, the anaesthetist should clear any secretions that are accumulating, by repeated aspiration and a good airway should be maintained.

As soon as the operation is over, the anaesthetist should give plenty of oxygen so that full aeration of the lungs is achieved. In the post-operative period, the following system should be adopted to prevent any lung complications :—

1. Deep breathing exercises should be encouraged

2. Posture of the patient should be changed from side to side every hour and this has become a part of the routine post-operative treatment in all cases of major surgery and thus massive collapse of lung has practically disappeared, although smaller degrees of atelectasis do occur now and then.

The treatment consists in preventing the condition. Atelectasis must be prevented, patient must be made to change his posture every hour and do deep breathing exercises. As soon as possible, the patient must assume a sitting posture to prevent any hypostatic congestion. After a general anaesthesia, the anaesthetist should clear the mouth and pharynx of the patient. The nurse should see that the airway is maintained in position and the throat is cleared of any mucus from time to time till the patient recovers consciousness completely.

If the patient develops pneumonia, the dyspnoea may be treated by oxygen inhalation and infection by systematic chemotherapy and antibiotics. A consultation with a medical colleague may be useful in those cases where the patient has some cardiac decompensation. With the advent of antibiotics, modern methods of anaesthesia and improvements in pre-operative and post-operative care, this particular complication is not so commonly seen in the post-operative ward.

Post-operative Retention of Urine and Urinary Infection

Retention of urine is likely to occur after major abdominal surgery. This complication is more likely to occur after spinal anaesthesia. The majority of these patients are not able to pass urine when they are lying in bed and the following measures may be adopted:—

1. Suprapubic fomentation. In some cases, after minor surgery, the patient can be asked to stand to pass urine.
2. If the patient has not passed urine for 16-18 hours and examination of suprapubic region reveals that the bladder is distended, catheterisation should be done with aseptic precautions.
3. The patient is also given an alkaline diuretic mixture.
4. Chemotherapeutic drugs are given as prophylactic.

If urinary infection occurs, patient can be given Streptomycin 1 gm. a day to control infection.

is valuable if cough is distressing. An expectorant mixture with ammonium chloride should be given to the patient.

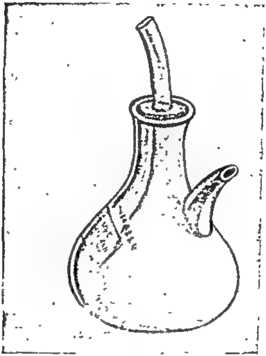

Fig 1 Nelson Inhaler.

Penicillin is given to combat the infection that is likely to occur. If this infection is not controlled, the patient is likely to get the next complication of tracheo-bronchitis or post-operative pneumonia.

Post-operative Pneumonia

In this condition, patient complains of cough and chest pain, the sputum is rusty or blood stained and the patient has slight cyanosis and dyspnoea. The ala nasi will be working and clinical examination will reveal a patch of pneumonia. Post-operative pneumonia may also occur after an atelectasis of lung or after aspiration of the vomit.

a small blood transfusion is advisable in addition to saline and glucose. Intravenous administration of amino-acids or plasma also brings about a rapid change to normal. Plenty of vitamins should be given during the period of ileus and blood chemistry alterations should be corrected by fluid therapy.

Care of the Bowels in the Post-operative Period

This is referred to in greater detail where necessary in other chapters.

If the patient has obstinate constipation, he must be given :

1. Liquid paraffin, half an ounce, morning and evening, by mouth;
2. An olive oil enema followed by a soap and water enema. In some cases, the gloved finger may have to be used to remove hard faecal masses.

Gastro-intestinal Symptoms

Another important symptom which most patients complain of in the post-operative period is vomiting. This may occur during the operation itself especially if the patient is under spinal anaesthesia. Vomiting or wretching is quite common when the surgeon is manipulating the bowels and certainly very troublesome for the operator when he is doing gastric or upper abdominal surgery. Even when pelvic operations like Hysterectomy are being done, this particular complication is certainly annoying to the surgeon as well as to the patient. Usual method of combating this is to give the patient plenty of oxygen, inhalation of spirit ammonium aromaticus or to give some sedation, especially if the patient is a little high strung or nervous.

After the operation, the patient may have vomiting which may last for about 6 hours If it lasts for more than six hours, it means that there is something abnormal and either the patient has developed a mild degree of acute dilatation of stomach or a paralytic ileus.

Repeated catheterisation should be avoided as far as possible. Carbachol tablets have been used with varying degree of success. If retention persists, catheterisation may have to be continued for two or three days more.

In some cases, an indwelling catheter may be necessary for the bladder to regain its tone, especially if overdistension has occurred.

Post-operative Abdominal Distension

This is a complication that usually follows abdominal operations. This occurs usually 24 to 48 hours after the operation. A mild degree of paresis of the gut or paralytic ileus may occur due to exposure of the intestine or due to rough manipulations during operation. Sometimes, it occurs after peritonitis, due to an intestinal perforation or intestinal obstruction.

The following measures are usually adopted for these cases :—

(1) Turpentine stupes to the abdomen.

(2) An indwelling Ryle's tube or Levine's tube or Miller Abbott's tube is passed to decompress the distended intestines

(3) Intravenous fluids to maintain fluid balance

(4) Injection of Morphia has been found to be useful in stimulating intestinal peristalsis

(5) In those cases where no intestinal anastomosis is done, calcium pantothenate and prostigmine in small doses can be given every 4 or 6 hours. A flatus tube should be passed before this is given.

If the patient has developed a paralytic ileus, a Wangenstein's suction syphonage should be adopted to decompress the intestines and fluids should be given parenterally till the ileus is overcome.

A blood chemistry check-up is very necessary in these cases, especially serum chlorides, CO_2 combining power of blood and blood urea. If the patient is getting dehydrated,

(5) In cases of intestinal obstruction or peritonitis, Wangenstein's suction syphonage should be established to decompress the intestines.

(6) Chlorpromazine or 'Largactil' has been found effective as an anti-emetic and for intractable hiccoughs. The dosage is 10 to 50 mgms. orally or 25 mgms. parenterally.

(7) In some intractable cases, injection of novocaine or alcohol can be done to block the phrenic nerves either unilaterally or bilaterally.

(8) The surgical measure consists in cutting or avulsing both the phrenic nerves. This is indicated in cases which fail to respond to all the other measures.

Post-operative Parotitis

This complication is likely to occur in debilitated individuals and in persons who have dental infection. The infection is likely to reach the parotid gland from the mouth through the Stenson's duct or it occurs as a blood borne infection. If such a condition occurs in the post-operative period, it is a standing monument of inefficiency in nursing and preoperative care. "Prevention is better than cure". Oral sepsis should be treated before any elective operation is done. If the patient has dental infection, the patient is referred to the dentist for a complete check-up. Cleaning up of the teeth and the mouth every time before and after a feed should be instituted. Gargling with Dettol or any other suitable antiseptic should be done twice a day.

In the post-operative period, the nurse attends to the teeth and the mouth thrice a day and gives the patient a small piece of lime to suck to promote salivary secretion. If the patient develops parotitis, he must be immediately put on penicillin and fomentations applied over the parotid region.

X-ray therapy is advocated by some for clearing up the acute parotitis. Once pus has formed in the parotid gland, it has to be evacuated.

The nurse should see to it that the patient does not aspirate the vomit and the intern should pass a Ryle's tube and connect it to a Wangenstein's suction. All fluid by mouth is stopped and fluid balance maintained by parenteral administration. If the vomiting is due to morphia, another sedative should be tried.

Sometimes, it may be necessary to wash the stomach with *5% soda bicarb. In cases of intestinal resection the Wan*genstein's suction is maintained till the normal peristaltic movements have started and the patient is able to pass gas *per via naturalis.*

Post-operative Hiccough

Hiccough, although a common and usually a benign symptom, may be a manifestation of any one of the following conditions :—

(a) Gastro-intestinal disorders,

(b) Renal failure,

(c) C. N. S disorders,

(d) Infective and other diseases,

(e) Neuroses.

Treatment of the cause may be enough to clear the symptom Various measures have been suggested and in spite of them, the symptom may be so prolonged and severe as to jeopardise the patient's life. The treatment adopted to relieve this condition is as follows :—

(1) Sedation. Drugs like pentobarbital sodium 0·1 G orally may be given. In some cases, morphia may be useful to control the symptom

(2) *Fluid balance must be corrected.*

(3) Carbon-dioxide inhalations for three minutes along with oxygen has been found to be very useful in controlling hiccoughs.

(4) Anti-spasmodics, like atropine sulphate 1/200 to 1/100th grain may be given subcutaneously.

The time for removal of skin sutures depends upon the type of operation and the presence or absence of complications. For upper abdominal surgery, the sutures are removed on the 10th or 12th day. If the patient has any cough and the general health is not good, the sutures can be removed a day or two later. Alternate sutures are removed first and two days later, all the other stitches. For other types of operations, the time for removal of sutures has been mentioned in the respective chapters. After removal of the sutures, the wound should be strapped and the patient should be warned not to put any strain at the site of operation.

Bed Sores

This complication is likely to occur especially if the patient is confined to bed for a long time. Patients who have had fractures of the spine with paraplegia and patients who are very much debilitated are likely to get this complication.

The nurse can help these patients by:

(1) Attending to the back of these patients as often as possible by rubbing the skin with alcohol and applying talcum powder. This promotes circulation in that area.

(2) Changing the position of the patient.

(3) Giving the patient rubber mattress and air cushions and thus avoiding any pressure on the bony prominences.

(4) If the patient is having a rectal or urinary incontinence, the nurse must do everything in her power to keep the bed dry and prevent this unfortunate complication.

If ulceration occurs, the sloughs have to be separated and removed and cod liver oil dressings or vaseline dressings are applied. Parenteral administration of penicillin may have to be given. If the patient has urinary incontinence, an indwelling catheter in the bladder should be left for continuous drainage.

If the bed sore is infected with streptococci and bacillus coli it should be dressed with penicillin sulphanilamide

Post-operative Pain

Many patients, after reaching the post-operative ward, begin complaining of pain when the effects of anaesthesia are wearing off. After noting the type of sedation that had been given to the patient by the anaesthetist, morphia 1/6th to 1/4th of a grain depending on the age of the patient is given. This is repeated if necessary after 6 to 8 hours. At bed-time, patient gets the usual dose of 1/6th to 1/4th grain of morphia or omnopon to promote good sleep. The posture of the patient may be altered and he may be made to lie in the most comfortable position.

Post-operative Thirst

Thirst is one of the most common complaints. This is treated by giving small sips of water to wet his lips and tongue. No fluid is given by mouth in cases of gastric or oesophageal surgery. When the fluid balance is properly maintained, most of the patients do not complain of any thirst

During the post-operative period, the fluid and electrolyte balance must be properly maintained and repeated blood chemistry check-up must be done to find out how the patient is progressing.

Diet

The *diet* of these patients varies according to the type of operation performed and is described in detail in the respective chapters. Usually liquid diet is given for the first two or three days and later on, a soft or semi-solid diet depending on the condition of the patient.

Post-operative Care of the Wound

In most of the clean cases, the wound heals by first intention. The house surgeon should look at the wound on the third day and subsequently on alternate days to find out whether there is any haematoma or stitch infection. Removal of drainage tubes or drains should be done after consulting the surgeon.

CHAPTER 3

OPERATING ROOM PROCEDURE AND CARE

The operating room and its adjuncts may be compared to an industrial plant in which the finished product, in this case the patient, is turned out with the maximum of efficiency and safety. There is a point below which cost cannot be cut without sacrifice of safety. While surgery and good surgery can be done in an emergency in primitive surroundings as seen in the last War and while extravagance is to be discouraged as needlessly diverting funds from the objects to which they should be devoted, it must be recognised that there is an irreducible minimum which is necessary in the planning of hospitals for permanent use.

Operating room cleanliness is of major importance in the prevention of wound infection. Because of a busy schedule of operations, the sister in charge of the theatre should plan the work for the orderlies and make a daily inspection of the nurses working in the theatre. The personnel working in the operating room should know what work they have to do each day and get their plans worked out the previous day by the operating room staff nurse and the sister. If all the work falls on one nurse, she becomes discouraged and the work that is turned out is not likely to be of top class owing to overwork. It is the team spirit and the co-operation between the orderlies or ward-boys, the nursing personnel and the surgeons that makes or breaks the hospital and determines its reputation in the community. The practice of aseptic surgery demands a strict observance of pre-operative sterilisation of surgical materials, of pre-operative cleansing of the operative areas, of rigid adherence to the rituals of cleansing hands and arms, of strict observance of aseptic principles during and after the operation and till the wound is healed. The success of an operation depends not only upon the skill of the surgeon but also upon the care exercised by the sur-

powder for a few days. This local treatment is combined with systemic penicillin therapy.

If the ulcer is infected with B. pyocyaneous it is treated with 4% boric acid solution or 2.4% phenoxetol (Beta phenoxy ethyl alcohol) solution (Berry, 1944). When the ulcer shows epithelization, scarlet red ointment or pellidol ointment (diacetyl amino azo toluol and soft paraffin) may be applied. In some cases if the raw area is very big plastic operations have been done to cover the area. These operations should not be done if the general condition is poor or if the bed sores have occurred due to paraplegia.

After Care: The patient must become bed sore conscious especially if it has occurred due to lesions of the spinal cord. He should never sit on a hard surface. He must always carry with him an air cushion. He should also constantly change his position while sitting, and just before going to bed the part should be massaged with alcohol and dusted with powder to promote circulation.

if rapid sterilisation is necessary, the pressure has to be raised to 20 to 25 lbs. Dry heat sterilisation has been used to sterilise oils, glycerine, vaseline, sulphonamide powder, etc.

Chemical Sterilisation

The following chemicals have been used for sterilising:—

1. Alcohol has been used for sterilising sharp-edged instruments, needles and for cleaning the operative area. It kills the vegetative bacteria.

2. Iodine is the next drug that has been used for a very long time for cleaning up the operative area.

3 Formaldehyde vapor has been used for sterilising sharp-edged instruments, electrical appliances, cystoscopes, and ureteric catheters, etc.

4. Mercurochrome has been used in some clinics for pre-operative skin preparation. It stains the skin over the area used.

5. Tr. Merthiolate is another drug that is used for pre-operative skin preparation.

(The latter two are expensive).

6. Phenol is an useful antiseptic and a disinfectant which kills all vegetative bacteria and is useful for disinfection of instruments and utensils.

7. Lysol is very useful for disinfection of sharp instruments.

Some of the drugs like Sulphonamide should be ready in the operating room for use by the surgeon. Sulphonamide or Sulphathiazole powder should be kept in tubes and sterilised by dry heat at 315° F. for 1½ hours. It should be kept in test tubes and the number of grams in each test tube should be marked so that the surgeon may know how much is used at a time for a patient.

Penicillin and Streptomycin also should be available in the operating room so that it may be given intramuscularly or applied topically.

geon, his assistants and the nursing staff in all procedures pertaining to the patient.

Sterilisation

Sterilisation can be done either by physical methods like heat or by chemical methods. Sterilisation by heat is one of the recognised methods of destroying non-pathogenic and pathogenic organisms including spores which may be in the materials and articles sterilised Boiling of the instruments is one of the methods in vogue for sterilisation. The highest temperature that can be obtained is 212° F and this destroys all vegetative bacteria. Adding a little of 2% Sodium Carbonate to the water in the instrument steriliser hastens the destruction of bacteria by accelerating the rise of temperature. Sodium Carbonate also decreases the corrosive action of water on instruments. The instruments should be boiled for at least 30-45 minutes for removing all vegetative bacteria. Steam under pressure is another recognised method of sterilisation and the apparatus used is either a pressure steriliser or an autoclave.

By the help of these autoclaves or pressure sterilisers, the temperature can be raised to any level With a 15 lbs. pressure in the pressure steriliser, a temperature of 250° F can be reached and all bacteria destroyed in 20 minutes With pressures of 25 lbs. and above, the temperature of the steam can be raised to 275° F. and in half the time, all pathogenic organisms including the spores can be destroyed It is the heat and not the pressure that destroys the bacterial life To see whether the sterilisation is effective or not, one must check on it every 10 days by sending packets of gauze or cotton from the bins that have been sterilised to the Bacteriology department to check on its sterility Rubber gloves, rubber tubing and other articles can be sterilised in 15-20 minutes at 15 lbs. pressure when the temperature rises to about 250° F. If suture materials like silk, cotton or nylon are used, 15-20 lbs. pressure for 30 minutes sterilises the articles completely. Instruments also can be sterilised by steam and at 15 lbs pressure, it takes about 30 minutes and,

lulose into an absorbable haemostatic chemical. Gel-foam whose essential ingredient is gelatin may be used for haemostasis in neurosurgery and other operative procedures. Gel-foam is available in packets.

The house officer on entry in the theatre must carefully watch all the details in cleansing of the hands and arms and the operating area on the patient. Cleansing of the hands and arms should be done with soap and water and this procedure must be done for 10 minutes by the clock.

Hand Sterilisation

The hands of the surgeon and his team are even more important than the skin of the patient. The no-touch system introduced by Lane and others, where tissues are handled only by instruments, is the ideal in the bacteriological sense but impossible for application in the majority of operations. There is no longer any effective protest against the use of gloves and it is useless to argue the pros and cons of the question. Sooner or later, the surgeon who operates without them will meet a catastrophe directly traceable to quaint divergence from the established practice. Gloves torn during operation must be replaced as it has been found that hands cleansed to the point of showing no bacteria on culture of their surface became contaminated after a varying period owing to the escape of skin organisms from glands, nail folds and deeper layers of the skin. Thus a ten minutes scrub of the hands and arms, the details of which are given below, would be very necessary.

A point of considerable importance is the care of the surgeon's hand. The old addage "Choose your surgeon by his finger nails" expresses the demand that the surgeon must be careful of his hands keeping the nails trimmed and neat and the skin clean and soft.

Scrub-up Rules

1. Hands, arms and elbows must be thoroughly washed with soap.

The next important material that should be available is "Oxycel" or gel-foam Oxycel or oxidised cellulose products are made from various materials such as gauze or cotton by a special process of oxidation which converts unoxidised cel-

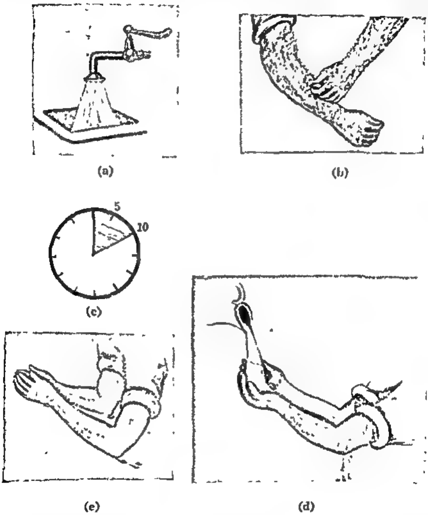

Fig 2. (a) Open tap, wet hands and forearm; (b) work up rich lather; (c) 10 minutes, (d) After scrubbing with Ether Soap, hands and forearms are washed in Sterile water, (e) Shows how the hands should be held to allow the water to run down the elbows after washing with sterile water.

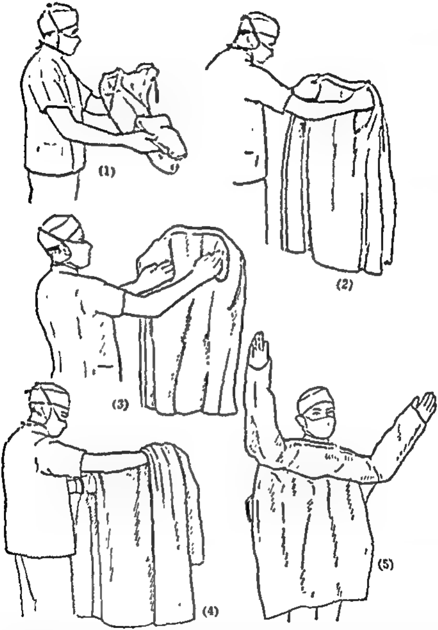

Fig. 4. Correct method of wearing a Gown.
(1) Gown is held well away from the body and is being opened so that the hands can slip into the sleeves simultaneously. (2), (3) & (4) Show the method of slipping the hands into the sleeves of the gown. (5) The outside of the gown has remained sterile throughout this procedure.

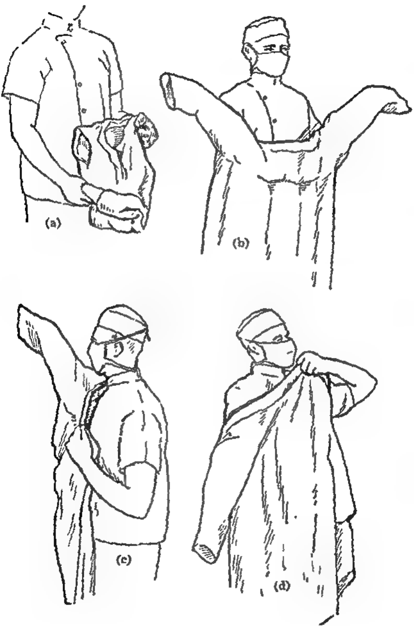

FIG. 3 Diagrams a, b, c & d showing wrong methods of wearing a Gown

unsterile water from just above the elbow may run back on the scrubbed area.

6. The arms and hands are then dipped in 70% alcohol for 1 minute.

For subsequent operations, a 3 minute scrub is enough.

Several germicidal solutions have been used to clean the skin. The latest is "G-11" solution, a synthetic phenol compound. Hexachlorodiphenyl methane or "G-11" seems to be an excellent disinfectant and sterilises the skin in 2 minutes. In some clinics, this solution known as Phisoderm is used by surgeons to wash their hands before operation.

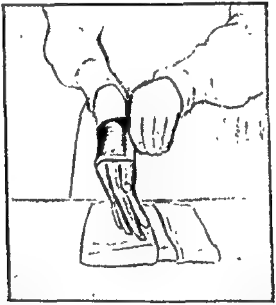

FIG. 5. Method of wearing Sterile Gloves—*Step* 1. Surgeon picks up right glove by cuff with left hand and pulls it on the hand. Surgeon does not touch outer side of glove with hands, during this procedure.

7. Arms and hands are dried with a sterile towel using a rotating motion and proceeding from the fingers to the elbows. After the elbows have been dried, the towel should not be brought back over the dried forearm and hand, as the part above the elbow is not surgically clean. A separate sterile towel should be used for each arm and hand.

2. Sterile brush is taken from the pan and the hands, arms and elbows thoroughly scrubbed for 10 minutes. It is important to scrub the four sides of each finger and particular attention is directed to the finger tips and nails.

3. The arms are then washed under running water.

4. Ether soap should be used for scrubbing for 1 or 2 minutes. The hands and the forearm are then washed with sterile water.

5. The arms should be raised so that all the water runs down to the elbow. The arms should never be lowered as

(6)

(7)

Fig. 4. Correct method of wearing a gown (*Contd.*)

(6) The assistant nurse places her hand on the inside of the gown and aids the operating room nurse to put on the gown and ties the gown strips at the back. This procedure must be adopted when wearing sterile gowns (7) A sterile towel is fastened to the gown on the back of the operating room nurse by a circulating nurse.

ting on the gown and in doing so, she should keep her hands on the inside of the gown. When tying the strings, she should catch the ends of the strings without touching the sides or sleeves of the sterile gown. After the gown has been tied, the hand should be powdered using a sterile powder. The powder usually used is K 285 prepared starch powder and this produces the least reaction in the wound and does not cause damage to the tissue and dissolves readily Another make that is also available is "Bisorb powder" (Johnson & Johnson Corporation).

The diagrams above (Figs. 4 & 5) will illustrate the method of wearing the gown and gloves. Before wearing the gown, the surgeon should wear a sterile cap and mask and the nurse should help him to tie the mask behind. In the operating room, the visitors and staff must wear over their shoes coverings of canvass or other material, gowns and masks. Perspiration from the faces of the operating team must be watched for by the nurse and she should wipe it from the face and glasses without contaminating the gown, gloves or the operating field

Cleaning the operating field

This preparation is done in the ward by the staff nurse.

1. The skin is scrubbed with soap and water for about 2 minutes at least, 12 to 24 hours before operation, the part having been shaved previously.

2. The part is then cleaned with 70% alcohol. It is then covered with sterile dressings.

Preparation of the operating area just before operation should be done as follows:—

The scrubbed assistant surgeon or house-surgeon has to do it just before the operation The operating field is scrubbed with ether soap by a soft brush The area is then washed with sterile water. It is then painted with an antiseptic either Acriflavine in spirit or Harrington's solution, Tr Merthiolate or Tr. Zephrin, etc. A sufficient area should be prepared so that there would be no contamination, should the surgeon wish to extend the incision or if the drapes are to be removed.

Application of sterile gown: The folded gown is lifted from the table and is carefully opened without touching its outside. The gown must be held in such a manner that both the hands can be slipped into its sleeves without touching the outside. Then the nurse assists the surgeon in put-

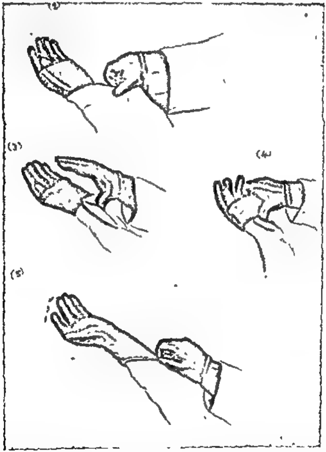

Fig. 5. Method of wearing Sterile Gloves *(Contd.) Steps 2 and 3.* Surgeon folds the sleeves before pulling up the gloves over the sleaves of the gown. *Steps 4 and 5.* Surgeon picks up left glove with the right glove hand, keeping gloved fingers under cuff and pulls left glove over the wristlet of gown The thumb of the Surgeon keeps the folded wristlet of the gown in position until cuff has encased the gown. The gloved hand must not touch the skin.

The cleaning of the operating area should be started in the centre using a sponge and proceeding to the periphery and the sponge discarded as soon as it has reached the periphery. After this preparation, the patient is draped with sterile towels leaving the area of the operation open. In some clinics, the preparation of the operating area is done for the first time after the patient is anaesthetised. The part is shaved and washed with soap solution or phisoderm. This has been reported as an effective method of sterilising the skin before operation.

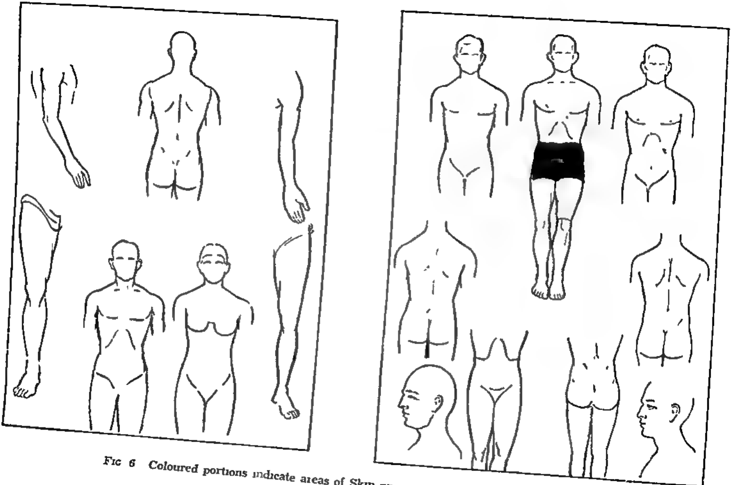

Fig 6 Coloured portions indicate areas of Skin preparation for different operations

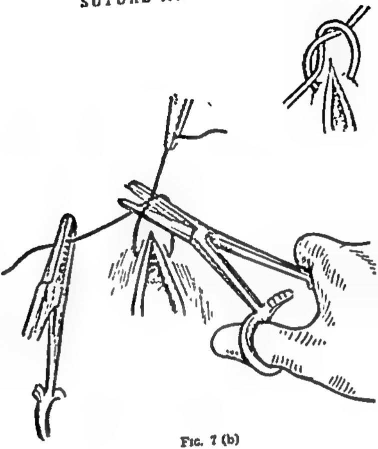

Fig. 7 (b)

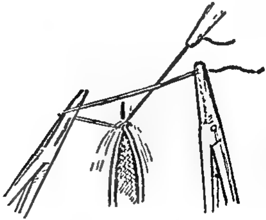

Fig. 7 (c)

CHAPTER 4

SUTURE MATERIALS

In modern surgery, many kinds of suture materials are used. All suture materials fall into two classifications:

(1) Absorbable sutures, as their name implies, are absorbed by the tissues in which they are embedded during and after healing processes. Absorbable suture materials are catgut, ribbon gut and Kangaroo tendons

(2) Non-absorbable sutures are not absorbed by the body cells and fluids. When used beneath the skin, they become surrounded by fibrous tissue and remain as foreign bodies. When used as skin sutures, they have to be removed after the wound has healed. The most commonly employed sutures of this type are silk, nylon, linen, cotton, wire, Tantalum and Dermalon.

"NO HAND TOUCH" TIE MURPHY

FIG. 7 a, b, c, & d are the various steps in tying the ligature.

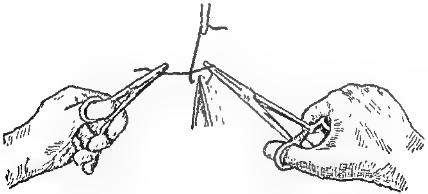

FIG. 7 (a)

Absorbable sutures: Catgut is derived from the submucous connective tissue of the sheep's intestine. It possesses great tensile strength and elasticity and is absorbed perfectly

plied in two forms, boilable and non-boilable. The two terms refer only to the method of sterilisation of the outside of the tube. The non-boilable tubes of catgut are sterilised by

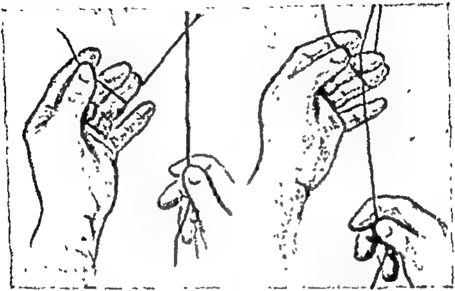

Fig. 9. (1) & (2).

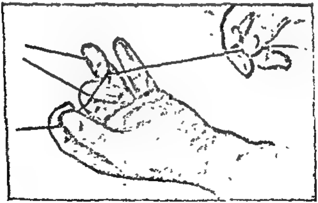

Fig. 9. (3)

chemical means by immersing them in 70% alcohol. Catgut is available in gauges from 6-0 to 3 (000000, 00000, 0000, 000, 00, 0, 1, 2, 3) the finest being the six, 0 catgut and the thickest

in healthy tissue, the time of absorption depending upon the method by which it has been prepared and the character of

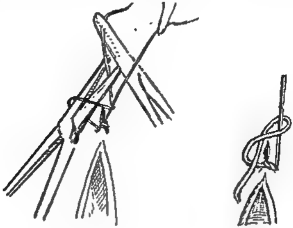

FIG. 7 (d)

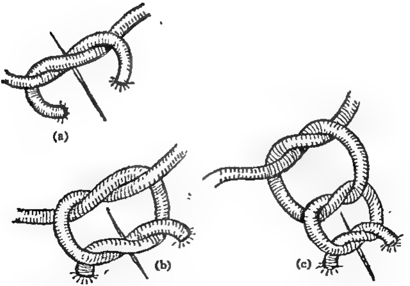

FIG. 8. (a) & (b) Surgeons knot; (c) Reinforced Surgeons knot

the tissue in which it is implanted. Catgut is sterilised and put in sterile hermetically sealed glass tubes which are sup-

No. 3. The trend in surgery is towards finer gauge sutures which cause less tissue reaction and permit more accurate approximation of wound edges.

There are two kinds of catgut available: (1) plain catgut and (2) chromic catgut. Plain catgut is prepared in the usual way but has not been treated to alter or lengthen its rate of being digested by body tissues and fluids. Chromic catgut is prepared in the same way as plain catgut but the catgut is chromicised and made tissue resistant by tanning process. This catgut is used so that it gives support till the wound has healed.

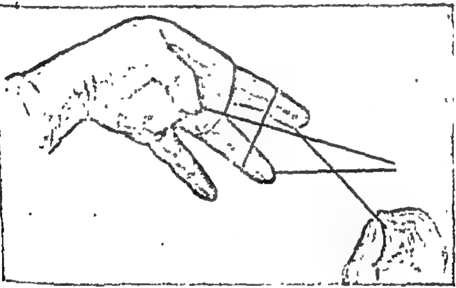

FIG. 9. (8).

The absorption time of these catguts may change according to the individual conditions. Anaemia, tuberculosis, other diseases and old age are apt to increase the absorption time of the catgut. Catgut, when used on serous coat or mucous membrane, gets absorbed four times as rapidly as when used on muscular tissues. Thus a nomenclature has been devised whereby catgut which will have its tensile strength in tissues for about 10 days is supplied in glass

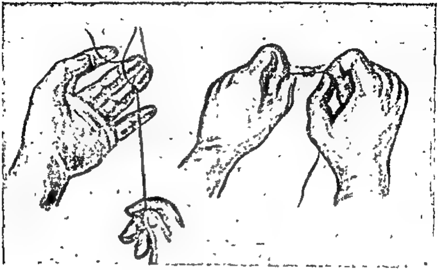

FIG. 9. (4) & (5).

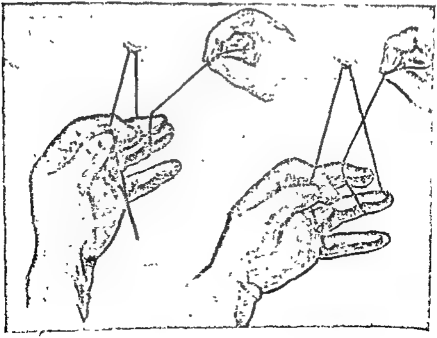

FIG. 9. (6) & (7).

years after operation, an abscess may develop round a piece of it.

When silk is used, the following details must be observed:—

1. Cutting the silk strands close to the knot.
2. Interrupted sutures placed close together.
3. Silk and catgut together should not be used in the same wound.
4. Perfect haemostasis.
5. Fine gauge silk must be used depending upon the type of tissue.
6. Gentle handling of tissues.

To-day, fine silk is used in gastro-intestinal surgery, brain surgery and in cardio-vascular surgery. If proper technique is observed, silk sutures become encapsulated and remain permanently in the tissues without giving any trouble.

Linen suture: This may be sterilised by boiling for 10 minutes or by autoclaving. The linen is gauged just as the catgut and is used in three sizes: fine, medium and heavy. It is used in certain selected cases of rectal surgery.

Cotton is available in a number of sizes and the following sizes are used:—

(1) Size 20 for through and through abdominal sutures.
(2) Size 40 for skin sutures.
(3) Size 60 for ligation of vessels.

Cotton should be autoclaved and can be used in place of silk or catgut in selected types of surgery and it remains in the tissues as a non-absorbable material.

Stainless steel. This is available also in many sizes depending upon the type of repair. It is used as tension sutures for tendon repair, as interrupted sutures for closure of fascial layers and also in orthopaedic surgery. It can be easily sterilised and gives support to tissues for a long period

tubes by manufacturers as ten day catgut. The next brand that is supplied by the manufacturer is twenty day catgut and a third one, forty day catgut.

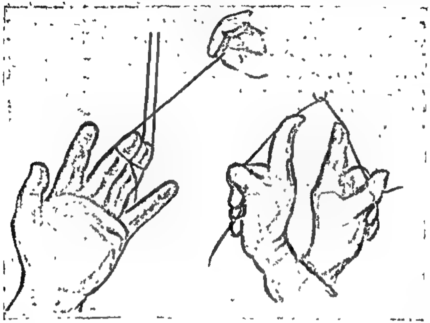

FIG 9 (9) & (10).

FIG. 9. (1) to (10) Shows method of tying knots with the hand.

The non-absorbable sutures: Silk is the most popular non-absorbable suture material. This material is available in sterile tubes as well as wound on non-sterile spools. For economic reasons, most institutions buy the non-sterile spools and sterilise the silk as needed. This is also available in various sizes ranging from 6-0 to No 5. Silk is best sterilised by exposure to saturated steam at 250° F. for 30 minutes. Boiling alone does not sterilise it completely and hence autoclaving is the best method to kill the spores. Silk has many advantages but one great disadvantage. It is strong, its knot is secure, its sterility ensured, its cost is reasonable and the same reelful can be used several times over. But a great disadvantage is that it is not absorbable, so that months or

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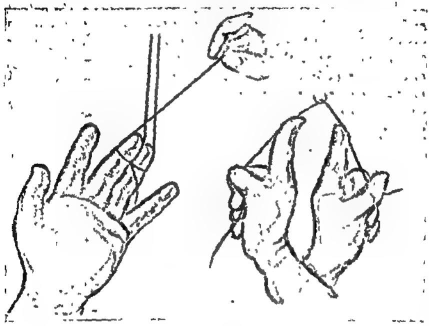

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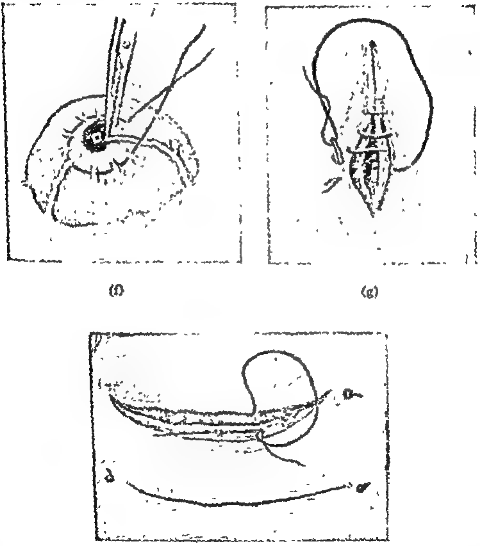
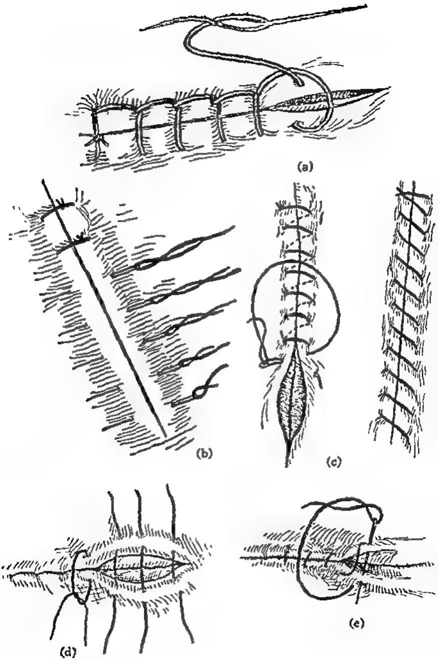


(f) (g)

(h)

Fig 10 Suture Technique (Contd) (f) Purse-string suture around appendicular stump. (g) Cushing stitch. (h) Subcuticular suture for closure of skin incision.

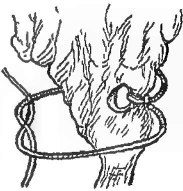

(a)
(b)
(c)
(d)
(e)

closure of skin edges and because of its fine gauge, scar formation very rarely occurs.

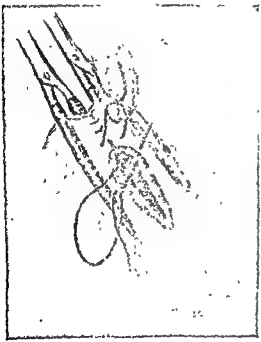
Nylon. This is a synthetic product prepared from coal-tar derivatives and resembles silk worm gut. It is sterilised by autoclaving or by boiling for 30 minutes. Its advantage is that it can withstand sterilisation a number of times and is useful for approximation of skin edges, and in many types of plastic surgery.

Fascia lata sutures. Strips of fascia lata are removed from the outer aspect of the thigh and are used to repair defects in the abdominal wall or diaphragm. These fascia lata strips are threaded on Gallie's needle and are used to repair defects in the abdominal wall like umbilical hernias, incisional hernias, ventral hernias and recurrent inguinal hernias. When these living fascial sutures are used, it is absolutely essential that asepsis and haemostasis should be faultless and abdominal distension should be avoided. Infection must be prevented by keeping the patient under an umbrella of antibiotics.

Tantalum is available in the form of wire, screws, plates and gauze mesh. It is useful in orthopaedic surgery and in cases of cleft palate, repairs of skull defects and hernias. This can be sterilised by autoclaving. Its great advantage is that it is a non-irritating metal and produces no reaction in the tissues and hence it is useful for plastic surgery and neuro-surgery.



(j)



(i)

FIG. 10 Suture Technique (*Contd*) (i) Connel suture. (j) Transfixing suture for omentum.

Silk worm gut is available in various sizes. This is sterilised by autoclaving or by boiling for 20 minutes and it is used as tension sutures while closing abdominal wounds and also for approximation of skin edges. The disadvantage is that it is rather difficult to tie the knots.

Horse hair. This suture material may possess spores and therefore must be sterilised by autoclaving. It is useful for

A. **Initial disturbances:** The low cardiac output is shown clinically by mental and physical weakness, low metabolism and subnormal temperature. The tachycardia and the poor volume pulse again confirm the diminished cardiac output.

B **Stage of compensation — reversible shock.**

The sudden fall of cardiac output is a threat to the life of the patient. So a quick redistribution of blood takes place in such a way that tissues like the extremities and splanchnic area suffer from diminished blood flow, so that the brain may get adequate blood supply at a favourable pressure. This is achieved by widespread peripheral vaso-constriction.

C. **Stage of decompensation — irreversible shock.**

The widespread vaso-constriction in the compensated stage is mainly due to constriction of the meta-arterioles and pre-capillary sphincters In the irreversible stage this vaso-constriction is replaced by widespread vaso-dilatation probably due to extensive vasomotor paralysis, resulting in capillary stagnation and eventual cessation of blood flow. Possibly many mechanisms are at play. Recently Shorr and his associates have demonstrated the presence of vasomotor depressor material (VDM) in blood in this irreversible stage, in animals. When such blood is transfused into a healthy animal, it causes a fall in B.P. and diminished response to epinephrine.

Pathogenesis: As already mentioned, the central theme of shock is diminished cardiac output, resulting from reduced venous return. This reduced venous return may be due to:

(a) Loss of fluids locally into the tissues,

(b) Nervous factors as in cases of immediate collapse which follows a bullet wound, "Solar plexus punch", testicular trauma and perforation of a hollow viscus

Clinical Features: The patient is generally quiet (except in cases of haemorrhage, when he is restless) and responds

CHAPTER 5

SHOCK

Shock is a form of acute circulatory failure characterised by a sudden fall in arterial blood pressure, rapidly developing mental torpor, weakness, cold extremities and a rapid thready pulse, due to withdrawal of the blood from peripheral circulation to the vital organs.

Shock is said to be reversible, when the circulatory failure can be made good by appropriate therapy. When the condition does not improve, but deteriorates progressively despite adequate therapy, it is known as irreversible shock.

Surgical conditions which can produce shock can be classified as follows.—

1. Acute deficiency in venous return due to loss of blood or plasma
   - A. Haemorrhage,
   - B. Trauma,
   - C Surgical or post-operative,
   - D Burns
2. Pooling of blood in small blood vessels.
   - A Abdominal and testicular trauma,
   - B. Perforation of a hollow viscus.
3. Mechanical hindrance to circulation, Massive pulmonary embolism

Pathologic physiology: The common factor in all conditions *producing shock is a rapid and severe reduction in* cardiac output The various stages in the development of shock are:

- A. Initial disturbances,
- B. *Stage* of compensation—reversible shock.
- C. Stage of decompensation—irreversible shock,

a stage of irreversible shock sets in. Thus "anoxaemia or anoxia is that which not only stops the machinery but also wrecks the machinery".

3. Blood Urea.
4. Blood grouping.

Treatment

(A) Type of transfusion therapy for fluid loss in cases of shock.

The fluid lost must be replaced. The ideal in replacement therapy is to give back to the body the exact amount and kind of fluid which has been lost. If it is due to blood loss after extensive injury whole blood transfusion is essential. If blood is not available, then plasma transfusion has to be started. If neither blood nor plasma are available the next best substitute will be Plasmosan or Dextran (Glucose and saline solutions are not given for replacing blood volume deficiencies).

In the case of Burns the patient loses plasma which alone needs replacement. In the case of intestinal obstruction the patient requires saline and glucose. If the dehydration is very severe the patient also loses a little plasma and plasma or whole blood transfusion may be given.

(B) Relief of pain by analgesics. Morphia is the drug of choice in allaying anxiety and controlling the restlessness that occurs in cases of shock. Pain is completely relieved by this form of therapy and thus controls shock. Morphia in doses of $\frac{1}{4}$ gr. is given intra-venously. When the blood pressure has fallen and the blood circulation is slow, the absorption of this drug when given intra-muscularly or subcutaneously is retarded and if the drug is repeated, dangerous absorption might occur when the circulation improves. Thus it is best to give the drug intra-venously. When the drug is repeated one must find out the time that

feebly but coherently. The skin is *pale, cold* (cutis marmorata may be present) and *clammy*. Rectal temperature may be subnormal The pulse is rapid and weak. Respiration is generally quiet, unless in acidosis when it is deep and deliberate.

Hypotension is characteristic of shock, but in the early stages, the B.P. may remain normal due to compensatory vasoconstriction Urine is diminished and in severe conditions complete anuria may develop If the kidneys go to the stage of lower nephron nephrosis, oliguria may be associated with low specific gravity Blood may show leucocytosis, haemo-concentration and lowered—PH.

Potassium may be increased due to increased protein Catabolism and impaired renal excretion.

Summing up, the clinical features of shock are:

1. An anxious expression of face.
2. Skin moist and extremities cold.
3. Pulse rate—rapid and becoming thready in the later stages.
4. Low Blood pressure, Systolic being about 70 mm. Hg. or below in severe degrees of shock.
5. The mental condition being clear.

In later stages of shock, patient becomes restless, respiration becomes rapid and sighing.

The usual investigations that are done are:—

1. Hematocrit reading; The normal being about 45 and every point rise indicating 100 c c of plasma loss from the system

2. The blood pressure; Systolic may be about 70 which shows that the patient is in a severe state of shock and according to Wallace indicates a loss of [illegible] litres in the blood volume. When the blood pressure is about 50 or 60, the condition is very grave, and due to cerebral anoxaemia

Summary

Surgical shock can be prevented by:

(i) Improving the general condition of the patient and making him fit for surgery by proper pre-operative preparation.

(ii) Allaying the anxiety of the patient before an operation by pre-anaesthetic medication.

(iii) And controlling pain by proper anaesthesia.

(iv) Perfect haemostasis, gentleness in manipulation and good operative technique are all factors which prevent shock.

Blood, plasma or saline transfusion during the operative procedure plays an important part in preventing shock.

When the patient has developed shock the following measures are instituted:—

(i) Blood, plasma, or its substitutes or saline transfusion started depending upon the condition.

(ii) Trendelenberg position to be adopted.

(iii) Morphia to be given.

(iv) Warmth to the body, with blankets and hotwater bottles.

(v) Pressor drugs, and

(vi) Continuous Oxygen therapy.

has elapsed after the first dose, and also the condition of the patient. If the patient has no pain, there is no object in depressing respiration by further doses of morphia. If the circulation is good, morphia is given I.M. or S.C. and it can be repeated every 6 or 8 hours depending upon the needs of the patient.

(C) The body heat is conserved by covering the patient with blankets and placing hot water bottles. This has been condemned by some as it produces excessive sweating and fluid loss. This particular form of therapy is beneficial only when it is applied after the transfusions have been started and the blood volume deficiency corrected

(D) *Pressor drugs:* Various pressor drugs are available to raise the B.P. Some of them are Methedrine, Percorten, Eucortone, Nor-adrenaline and Cortisone. The Pressor drugs are useful only when the blood volume has been corrected; otherwise they are absolutely useless for they do not increase the cardiac output or increase the capillary flow, though they raise the B.P.

Nor-adrenaline or Arterenol is available in ampoules of 4 c.c. of 1 in 500 solution each c.c. containing the equivalent of 1 mgm of the base This is diluted in one litre of 5% dextrose and the rate of flow of the drug depends upon the elevation of Blood pressure. After the B.P. has been raised to the normal level the rate of drip is accordingly reduced to keep it at the same level.

Cortisone: 100 mgm every 6 hrs I.M. is the best remedy to combat adrenal failure Cortisone is of value in cases of shock due to burns.

(E) *Oxygen Therapy:* Is said to be useful in cases of anoxaemia. Oxygen therapy alone will not be of any use in the treatment of shock.

(F) *Position of the Patient:* The Trendelenberg position is adopted to favour cerebral circulation. This should not be used when there is any respiratory embarrassment.

thorax or it may be into the peritoneal cavity, a haemoperitonium or into the joint when it is known as haemarthrosis.

Primary haemorrhage: Primary haemorrhage results from the wounding or severance of any blood vessel and varies in character with the nature of the vessel cut. Thus it may be arterial haemorrhage, venous haemorrhage or capillary haemorrhage.

Reactionary haemorrhage: Reactionary haemorrhage occurs within 36 hours of the injury and is more common after prolonged and extensive operations accompanied by post-operative shock and low B.P. As the B.P. recovers after the operation the pressure in the vessels returns to normal and may be sufficient to displace the blood clots from the divided ends resulting in reactionary haemorrhage. This condition of reactionary haemorrhage may also be caused by the slipping of a ligature.

Secondary haemorrhage: This term is used to indicate any bleeding from a wound which has become infected. As a result of infection there is softening of the vessel walls and erosion occurs. Occasionally digestion of the clot causes secondary haemorrhage. Sometimes erosion of a vessel wall by a malignant growth may result in a secondary haemorrhage

The haemorrhage that occurs usually gets arrested by several factors:

(1) Coagulation of the blood in the lumen of the vessel at the divided end.

(2) Contraction of the circular muscle of the vessel wall.

(3) Muscular retraction of the end of the vessel.

(4) Mechanical pressure of the external clot.

(5) Fall of B.P.

Clinical features in patients who have haemorrhage are:

(1) Increasing pallor of skin and mucous membrane.

(2) Rise in pulse rate, volume and tension becoming poorer.

CHAPTER 6

HAEMORRHAGE

Haemorrhage or loss of blood from the vessels is classified by three methods:—

(1) According to the vessel involved.

  (a) Capillary,
  (b) Venous,
  (c) Arterial.

(2) External haemorrhage and internal haemorrhage

(3) Primary, reactionary and secondary.

Haemorrhage is usually due to trauma but it may also be as the result of certain constitutional diseases like haemophilia, purpura, leucaemia and scurvy.

External haemorrhage may be due to wounds or from one of the natural orifices of the body. The common types that we come across are:

(1) Epistaxis.

(2) Haemoptysis.

(3) Haematemesis.

(4) Malaena.

(5) Haematuria.

Internal haemorrhage may be of two varieties.

(1) The subcutaneous which is more or less obvious

(2) The deep or concealed variety.

If the bleeding has occurred in the submucous or subcutaneous tissues it is known as extravasation. If the amount of blood collected under the skin is fairly large it is known as haematoma. In the concealed variety the bleeding may occur in the pleural cavity when it is called haemo-

It is also given if immediate surgery is contemplated or if symptoms of anoxia or shock are not rapidly controlled. If the patient is having internal haemorrhage as in cases of bleeding peptic ulcers or haematemesis due to oesophageal varices or bleeding diseases, emergency measures for haemorrhage and shock just mentioned must be immediately instituted.

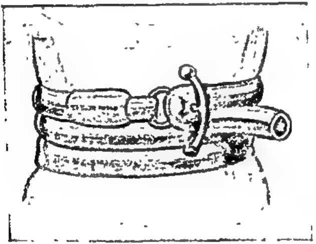


FIG. 11. Samways Tourniquet.

External haemorrhage which may be due to wounds or injuries to main vessels may be controlled by the application of a pressure bandage or in the case of bleeding from limb vessels by a tourniquet using an Esmarch's bandage or a Samway's tourniquet. The time of application of tourniquet should be noted and surgical treatment must be done to control the bleeding within 30 to 40 minutes. The usual general treatment is given for these cases. In addition, local treatment may be given which consists in ligation of blood vessels or arterial suturing if the main vessels have been damaged Sometimes Vitallium tubes or venous grafts are used to bridge the gap in a divided artery. Small bleeding points are stopped by the use of cautery.

Secondary haemorrhage: This is controlled by ligating the bleeding points that are exposed in the wound and pack-

(3) Air hunger.

(4) Sub-normal temperature.

(5) Restlessness.

(6) Thirst.

(7) Dimness of vision, sweating and in late stages Cheynestokes respiration passing on to coma and death.

Treatment: General treatment consists essentially in arresting the bleeding

(1) Complete rest and quiet are first essentials of every major haemorrhage.

(2) The head should be kept low by removing pillows and by raising the foot end of the bed on blocks so that the vital centres get enough blood.

(3) A hypodermic injection of morphia ¼ grain should be given.

(4) Enough warmth supplied by a radiant heat cradle or hotwater bottles but not too much to bring about sweating.

(5) The coagulative powers of blood are increased by giving:

(a) Calcium gluconate I V. and

(b) Coagulent CIBA I.M or

(c) Haemoplastin 2 to 3 c c. I.M. or

(d) Clauden I.M. or I V.

(6) Oxygen administered preferably by a mask at 5 to 10 litres per minute.

(7) Transfusion: If the patient is having severe haemorrhage blood transfusion should be given to meet the physiological needs. Transfusion must be given if haemorrhage is severe as shown by a fall in haemoglobin percentage below 50% or R B C. count below 2·5 Millions per c mm.

It is also given if immediate surgery is contemplated or if symptoms of anoxia or shock are not rapidly controlled. If the patient is having internal haemorrhage as in cases of bleeding peptic ulcers or haematemesis due to oesophageal varices or bleeding diseases, emergency measures for haemorrhage and shock just mentioned must be immediately instituted.

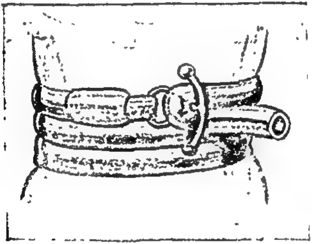


FIG. 11. Samways Tourniquet.

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Secondary haemorrhage: This is controlled by ligating the bleeding points that are exposed in the wound and pack-

ing the wound with absorbable gauze like gelfoam or oxycel. Sometimes tight packing with ordinary roller gauze after coagulating the bleeding points with diathermy current may stop the haemorrhage

Haemophilia is a congenital condition characterised by a tendency to bleeding either spontaneously or as a result of trivial injury. The disease is transmitted to the males by the mother who is herself never affected. These patients may be brought with profuse bleeding after dental extraction or after small cuts or injuries.

Treatment: No surgical procedure however trifling should be attempted in these cases. The bleeding and coagulation time should be noted and these bleeders should be protected from all injuries. Various methods are used to control the bleeding which consists in giving (a) Subcutaneous injection of whole human blood or horse serum, (b) Administration of Vitamin K., (c) Fresh whole blood transfusions and plasma transfusion have to be started. Transfusion of plasma (not older than 10 days) provides prothrombin fibrinogen anti-haemophilic globulin and certain other factors which may be of value in controlling bleeding

Local treatment consists in application of Russel's viper venom solution to the bleeding surface. This is followed by a tight pressure bandage to the raw area.

Loss of Blood during Operations

The blood loss during operations is estimated by two methods:

(1) Calorimetric method,

(2) Gravimetric method.

In the *Calorimetric* method the pads and sponges used during the operation are washed with tap water and the amount of haemoglobin present in the sample of the washings is determined by the use of photo-electric calorimeter, the reading of which is compared with a chart prepared pre-

viously for actual amount of Haemoglobin. The formula used by Baronofsky is as follows :—

$$\frac{100 \times \text{(milligrams of haemoglobin in sample as shown by photo-electric calorimeter)} \times \text{(Total volume of washings)}}{\text{Patient's pre-operative haemoglobin.}} = \text{Millilitres of blood lost.}$$

Thus the total amount of blood loss is determined.

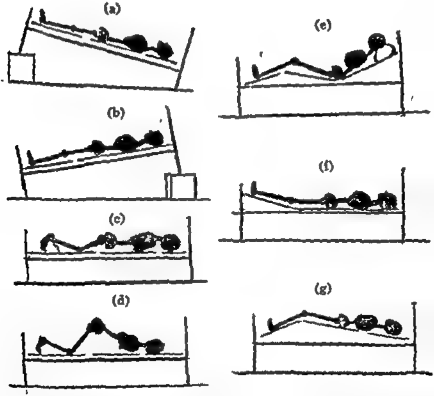


FIG 12. Bed positions for various conditions : (a) Shock vasomotor collapse (primary and secondary shock); (b) Head of bed elevated, increased Intracraninal pressure, *Hiatus* Hernia; (c) Prone position for artificial respiration, Decubitus ulcer of back or obstructed respiration in comatose patients; (d) Genupectoral position for rectal and Sigmoidoscopic examination; (e) Semifowler after operations and for dyspnoea from any cause; (f) Legs elevated for conditions like phlebitis or œdema of lower limbs; (g) Trendelenberg after pelvic operations.

In the *gravimetric* method dry sponges are used throughout the operation. The total weight of sponges before operation and the weight after its use are noted to calculate the blood loss. Roughly every gram rise in weight is considered as 1 c.c. of blood lost. During operations like radical mastectomy the blood loss varies from 300 to 400 c.c.

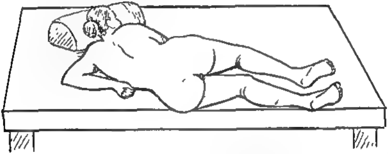


FIG. 12. Bed positions for various conditions (*Contd.*) (h) Sims position for speculum examination

The average blood loss in various operative procedures have been calculated both by calorimetric and gravimetric methods. The accompanying table will show the amount of blood loss that is expected in each type of operation so that the surgeon may take the necessary precautions to see that there is enough blood before starting the operation.

	Maximum blood loss.	Minimum blood loss.
Brain operations	2000 c.c.	500 c.c.
Thyroidectomies	1000 „	300 „
Radical mastectomy	1000 „	500 „
Thoracic operations	2500 „	500 „
Biliary operations	400 „	250 „
Gastrectomy	500 „	300 „
Splenectomy	1000 „	350 „
Colectomies	750 „	350 „
Prostatectomy	500 „	300 „
Total cystectomy with transplantation of Ureters	750 „	500 „
Kidney operations	1000 „	350 „

Thus it is the responsibility of the surgeon to know the amount of blood a patient may loose as a result of an operative procedure so that the operative blood loss can be corrected quicker. During the post-operative period the patient may loose blood which must be recognised early to replenish the depleted red-cell volume. The haematocrit reading done at this stage may be an useful index of uncompensated red-cell loss and may serve as a guide for replacement therapy.

Thus during the operation blood transfusion must be started to combat the blood loss and this is followed by glucose saline or glucose and water to maintain the fluid balance in the post-operative period.

CHAPTER 7

BLOOD TRANSFUSION

Blood transfusion has become popularised more particularly after the II World War. Many lives have been saved by it and many major operations are today done without fear of shock or worry of blood loss during the operative procedure. Blood transfusion as a pre-operative and post-operative measure has been recognised by all surgeons as an important step in the preparation of patients who are considered as bad surgical risks otherwise. Patients who come in with nutritional deficiency, anaemias, may be brought to the safe operative level by giving one or two transfusions before operation Within the last decade and a half, every important surgical clinic has taken advantage of this fact and surgeons to-day have felt that a patient can be safely prepared during the pre-operative period for operation and the progress in the post-operative period has been satisfactory due to blood transfusion being given during the operation and in the post-operative period, if necessary

Blood Banks have been opened for this purpose and it is found that emergency surgery to-day—has become safe after the advent of blood transfusion to combat shock and haemorrhage

Transfusion of whole blood restores the blood volume, the serum proteins and R B Cs as quickly as possible to the normal level It also stimulates haematopoiesis and the O_2 carrying capacity is also increased because of the introduction of R.B.Cs. Blood transfusion is indicated in the following conditions :—

(i) In cases of severe haemorrhage after injuries like penetrating injuries of the chest and abdomen.

(ii) When the patient has got severe shock due to burns, multiple fractures where the important feature is a reduction in the circulating blood volume.

(iii) As a pre-operative measure before major operations.

(iv) During major operations.

(v) In cases of severe infections, the effect of a small transfusion is striking.

(vi) In cases of haemophilia or blood dyscrasias, blood transfusion is certainly a life-saving measure.

(vii) In surgical conditions like intestinal obstruction, general peritonitis, etc., the good effects of a whole blood transfusion are well-known

(viii) In patients with hypoproteinaemia, plasma transfusion or blood transfusion has been of great help in addition to the use of intravenous amino acids like Amigen.

(ix) Patients with hypoprothrombinaemia who have a bleeding tendency during operations benefit greatly from blood transfusion as it supplies the prothrombin to the circulating blood.

(x) In obstetric practice, where sudden loss of blood results as in conditions like placenta praevia and post-partum haemorrhage, blood transfusion is the sheet anchor in treatment.

Blood grouping:

There are at present three nomenclatures, Moss, Janski and Lansteiner (International). Lansteiner's nomenclature has been adopted as the international classification and the Health Committee of the League of Nations has advised all immunologists and blood transfusion specialists to stick to this international grouping.

Four distinct groups have now come to be recognised and the accompanying table shows the classification:—

Table I	Moss	Janski	Lansteiner or International	Agglutinogens	Agglutinins
Group	IV	I	O	None	a + b
Group	II	II	A	A	b
Group	III	III	B	B	a
Group	I	IV	AB	A + B	none

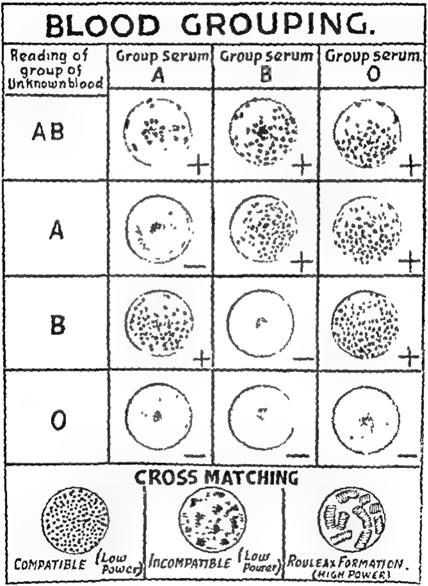

BLOOD GROUPING.
Reading of group of Unknown blood
Group Serum A
Group serum B
Group serum. O
AB
A
B
O
+
−
CROSS MATCHING
COMPATIBLE (Low Power)
INCOMPATIBLE (Low Power)
ROULEAX FORMATION. (HIGH POWER)

FIG. 13

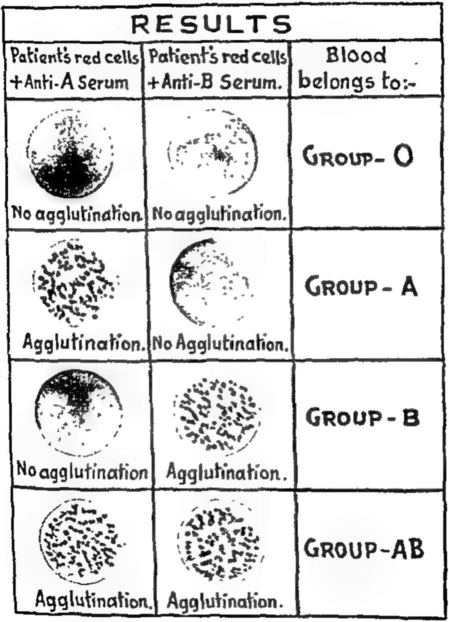

RESULTS
Patient's red cells +Anti-A Serum
Patient's red cells +Anti-B Serum.
Blood belongs to:-
No agglutination.
No agglutination.
GROUP- O
Agglutination.
No Agglutination.
GROUP - A
No agglutination
Agglutination.
GROUP - B
Agglutination.
Agglutination.
GROUP-AB

FIG 14

In the R B Cs. two agglutinogens are usually present and in the plasma there are two agglutinins. Among the other agglutinogens present in the R.B.C. may be mentioned the following M, N, MN, P and Rh factors.

Group "AB" has been called the universal recipient because of the absence of agglutinins in the serum and group "O" has been called the universal donor as it does not contain any agglutinogen in the cells.

Selection of a donor: Usually adults are chosen who have a negative WR and Kahn and who are not suffering from infectious fever and malaria Fasting donors are usually preferred to prevent any reaction Blood is drawn into a sterilised bottle containing 50 c c of 3% sodium citrate solution. This blood can be stored for about 10 days. Roughly about 3 c c per lb of body weight is the amount that could safely be withdrawn from a donor.

If the blood has to be stored for more than the required time, it should be converted into liquid plasma which can be kept for a much longer period, about a year.

In addition to grouping of the blood of the patient, direct cross-matching of the patient's blood with the donor's blood should be done before transfusion, as an additional safety measure to eliminate any intra group incompatibility. A drop of the donor's blood is tested against the recipient's serum.

Technique of blood grouping: 3 drops of blood are diluted with 2 c.c. of normal saline solution. On a white tile, two areas are marked out A and B. Two drops of the appropriate grouping seras A and B are placed on these areas. Two drops of erythrocyte emulsion in the test tube are then dropped on the A serum and the B serum If agglutination occurs clumping of the Erythrocytes will be easily visible If agglutination occurs with both sera, the blood belongs to AB group. If agglutination occurs with serum A, the blood group is B If agglutination occurs with serum B, then the blood belongs

to 'A' group. If there is no agglutination with both A and B sera, the blood belongs to 'O' group and persons belonging to this 'O' group are known as universal donors.

Rh factor: 85% of the normal individuals have an agglutinogen in the blood which has been found also in the Rhesus monkey and it has been called as the Rh factor. This Rh factor may be present in the RBC's in any of the four blood groups. The blood which contains the Rh factor is usually known as Rh + ve. Blood which does not contain this Rh factor is known as Rh negative. Only 15% of individuals are Rh − ve while the rest are Rh + ve. In India, the Rh + ve percentages is much more than the international finding, roughly 93 to 95%. In Rh negative patients, there is no antibody for the Rh factor and when blood containing the Rh factor (i.e., Rh + ve) is transfused into a recipient whose blood does not contain it, (i.e., Rh − ve), an anti Rh agglutinin is developed in the recipient's blood within 12 days. A second transfusion containing Rh factor (Rh + ve) if given to the same individual, may cause a serious transfusion reaction which may result in death although direct cross-matching is done, because of the interaction between Rh+ve cells introduced now with the antibodies that have already been developed in response to the previous transfusion. Transfusion of Rh − ve blood does not produce any Rh antibodies in the Rh − Ve individuals.

In order to ensure against Rh transfusion reaction in an Rh − ve patient, an Rh − ve blood must be used. Thus Rh factor is of great importance to the surgeon and the obstetrician. In a majority of cases, the infant inherits the Rh + ve factor from Rh + ve father while the mother may have an Rh − ve blood. Thus during pregnancy, small placental ruptures that occur may result in an escape of the Rh + ve blood of the infant into the mother's Rh − ve blood, resulting in the development of Rh antibodies in the mother's blood. These antibodies enter the foetal blood stream and cause severe reaction with the Rh + ve blood of the foetus and the mother may give birth to a baby with Erythroblastosis.

If the patient has to take more than one transfusion the Rh factor must be ascertained. Women during pregnancy should be transfused with only Rh — ve blood or, if they are Rh + ve, blood of an appropriate type which is Rh + ve should be given If an emergency transfusion has to be done for women who are having postpartum haemorrhage, Rh — ve blood alone should be used

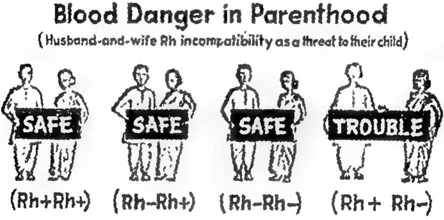


FIG 15.

Rate of administration of blood: The blood is given at a speed depending upon the clinical condition of the patient and the B.P. estimations If a patient has had a severe haemorrhage, the first pint or two may be given at a very rapid rate and later on, care is exercised in giving massive transfusions to patients suffering from toxaemia or chest wound. Over dosage may result in pulmonary oedema or severe cardiac embarrassment.

Marriot has emphasised that the Hb percentage of an individual can be raised to the satisfactory operative level by repeated blood transfusions. 1 pint of blood raises the Hb by 10%. If the Hb content has to be raised by about 20 to 30%, two or three transfusions may be given with an interval of two days and the rate should not exceed 1 c.c. per lb. of body

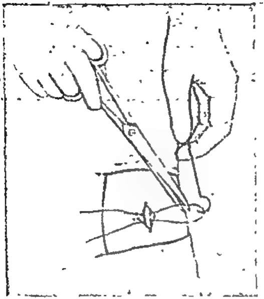


FIG. 16. A vein exposed at the elbow and a loop of plain catgut suture passed under vein with the help of an aneurysm needle.

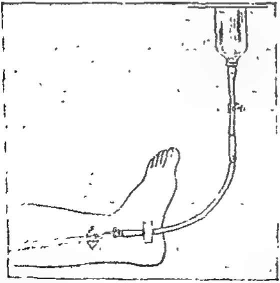


FIG. 17. The canula is passed into the vein after making a transverse nick on its anterior wall. The catgut sling is tied over the canula and vein to prevent any slipping of the canula and escape of blood. This figure shows the apparatus in use for rapid transfusion.

weight per hour in an average case and, if the patient has severe anaemia or cardiac disease, the rate should be reduced to ½ c.c. per lb. of body weight per hour.

This rule formulated by Marriot will prevent unfortunate complications due to rapid transfusion in weak subjects.

Difficulties experienced during the administration of blood: The house-surgeon sometimes is faced with this problem. The usual causes are :—

1. *Venospasm.* This is likely to occur especially if the blood is taken straight from the cold storage and given to the patient. This can be prevented by holding the bottle of blood and warming it by hands.

2. Blocking of the rubber tubing, especially if the R.B.C.'s are allowed to settle in the bottom. This can be prevented by gentle rocking of the bottle.

3 The transfusion needle may be hitching against the vein wall.

4. In cases of fall of blood pressure, the bottle should be raised to a sufficient height so that the blood might flow in or it must be pumped in by a sphygmomanometer bag.

5. *Don't give blood too fast at the start. Watch for* reactions and stop or slow down transfusion if the patient shows any reactions.

In infants, transfusion into the marrow of the sternum cannot be done as it is not developed before the third year.

Another route which has become popular of late is to pump in blood straight into the arteries Intra-arterial trans-*fusion is preferred to intravenous transfusion to treat esta*blished shock or as a preventive measure in operations where serious shock is expected. Intra-arterial transfusion therefore can raise blood pressure to the normal level, thus a dangerous state of circulatory collapse can be immediately reversed. The advantages that are claimed are :—

1. Normal systolic B.P. is promptly restored throughout the arterial system.

2. Blood flow to important or vital structures like the brain, coronary vessels and the kidneys improves rapidly.
3. Anoxia to the tissues is prevented.
4. Lost blood is replaced very quickly and easily.

When intra-arterial transfusion is given, the blood pressure must be recorded and transfusion must be carefully supervised to prevent any air embolism.

Complications of Blood Transfusion

(i) Circulatory failure may occur as a result of overloading of the circulation or it may occur secondary to a rigor. If the patient has anaemia of long standing, the mechanical efficiency of the heart will be proportionately reduced and, under such circumstances, a transfusion of normal volume given at normal speed may increase the venous return and the anaemic or toxic myocardium fails. The treatment for this would be to give the transfusion at a very slow drip rate and not to overload the circulation by giving a large amount of blood. During the transfusion, if the patient gets a dry cough or if he gets a constricting pain in the chest, it is an indication that there is an over-distension of the right auricle. If circulatory failure develops, immediately venesection should be done and morphia with atropine should be injected.

(ii) A slight reaction is usually present and in some cases, the patient may have a severe rigor and the temperature may go upto 104° to 105°F. This is most probably due to injection of foreign protein in some form or due to minor incompatibility. The treatment of this reaction would be :—

(a) Covering of the patient with blankets and application of hotwater bottles.

(b) Subcutaneous injection of adrenaline 1/1000 — $\frac{1}{2}$ c.c.

(c) If the patient has a severe rigor, morphia should be given. Atropine also should be combined to reduce the bronchial secretion which may collect and drown the patient. The slower the transfusion, the less likely is the rigor to follow.

(d) Antihistamines should be given.

(iii) Air embolism can be easily avoided. One should be very careful when intra-arterial blood transfusion is being given.

(iv) Agglutination in the cold-stored blood may result from a reaction due to the presence of cold agglutins. This can be avoided by keeping the patient warm during transfusion and giving it at a drip rate Don't heat the blood or put hot-water bottles around the bottle of blood.

(v) *Allergy and anaphylactic reactions*: Allergic reactions are probably due to patient's sensitivity to plasma proteins. Clinically, these reactions are usually mild and a varying degree of urticaria and eosinophilia may occur. If the patient is known to be allergic, it is wise to use a fasting donor and a sensitivity test using a donor serum can be done. Allergy can be corrected by giving the patient antihistamine drugs about ½-1 hour before the transfusion. Ephedrine ½ gr. tablet by mouth half an hour before the transfusion also prevents allergic reactions. In some cases hypodermic injection of adrenaline 1 in 1000 solution about 6 minims are given.

(vi) Transfusion syphilis is by no means a rarity. This, of course, can be prevented by doing the WR. and Kahn test before the donor's blood is transfused.

(vii) Transfusion malaria can also occur after blood transfusion. Persons hailing from malarial districts are unsafe as donors. If there is no alternative, the malarial attack can be prevented or controlled by giving antimalarial drugs prophylactically to the recipient.

(viii) *Transfusion influenza or infectious fever*. This is likely to occur if the donor had a recent attack of influenza or if the disease was in the incubation period.

(ix) Incompatible transfusion may set a train of complications. The warning symptoms are a bursting feeling in the head and severe lumbar backache. Lumbar backache is pathognomonic of incompatible blood transfusion. The transfusion should be immediately stopped. To prevent this com-

plication, direct cross-matching should be done always. As a prophylactic measure, alkalinisation of the patient should be done before transfusion. If there are minor incompatibilities, the Hb that is liberated by the intra-vascular haemolysis is precipitated in an acid urine and blocks the renal tubules, but if the patient has been alkalinised before, the Hb dissolves in the alkaline solution and is washed off. Alkalinisation therefore promotes diuresis and at the same time helps to wash the obstruction. If renal suppression has occurred due to incompatible transfusion, retransfusion as soon as possible with compatible blood is the most satisfactory method.

The other symptoms of incompatibility are rigors, jaundice, Haemoglobinuria, cerebral symptoms due to small emboli or haemorrhages in the brain and in some symptoms of renal failure. Urine should be carefully examined for evidence of Hb, RBC and casts and the volume passed should be recorded. The presence of Haemoglobinaemia and Haemoglobinuria constitutes the most reliable evidence of haemolytic reaction. In rare instances, the patient dies within a few hours. But more commonly Oliguria develops followed sometimes by complete anuria. Death may occur in [illegible] to 8 days from renal failure.

Treatment: The urine should be kept alkaline. This may be done by the administration of soda-bicarb by mouth or by the intravenous administration of one litre of sodium lactate solution 2 grams per 100 cubic centimeters or one pint of 3 to 4% sodium citrate followed by a slow drip of 5% glucose in water. Fluids should not be forced after the urine has once become alkaline. In some patients, a transfusion of 200 to 300 c.c. of freshly cross-matched blood together with alkalinisation of the patient may be beneficial to tide over the crisis.

(x) Homologous serum hepatitis is the next important complication. Jaundice may occur after a blood transfusion and is produced by an icterogenic virus in the blood. (Incubation period 100 days). The pathology of the homologous

serum jaundice is indistinguishable from that of infective hepatitis.

Transfusion of R.B.C. (Erythrocytes): Erythrocyte suspensions were given instead of whole blood as transfusions for a very long time. Transfusions of concentrated R.B Cs. (packed cells) are found to be very good in raising the Hb level; thus the deficit of Hb may be corrected quickly with this method than with whole blood since large number of R.B.Cs. are furnished without overloading the circulation. This method of transfusing concentrated red blood cells is of great value in cases of severe anaemia.

CHAPTER 8

FLUID ADMINISTRATION AND ELECTROLYTE BALANCE IN SURGERY

One of the great advances in modern medicine is the ability to supply the sick patient with fluids, electrolytes, serum proteins and amino acids through channels other than the gastro-intestinal tract. A healthy person eating and drinking normally is neither an acid base nor a water balance problem. The subject of acid-base equilibrium and fluid administration is complex. There is no doubt that the observations at the bedside of a patient are the basis of medicine. Medical observations alone can only be of qualitative value whereas, if blood chemistry studies are done, together with clinical observations, the physician is in a better position to understand the nature of the disease and its progress. It has been estimated that a 70 kgm. weight person has approximately 16 litres of fluid; the intracellular spaces contain about 76% of the total fluid volume and in this fluid, one finds proteins, phosphorus, potassium, calcium, magnesium and bicarbonates. The extracellular space represents about 15% of the total fluid volume and contains sodium chloride and bicarbonates. The blood represents 9% of the total fluid volume of the body and the plasma constituents are mostly sodium chloride, bicarbonates and proteins. It has long been known that a loss of total body water upto 10% is compatible with fair health, while losses of about 22—25% will result in death. This subject has therefore grown in importance within the last decade or so and has been found to be of great value to the surgeon in ensuring the welfare of his patients before and after surgery.

After abdominal operations, where feeding by mouth is not possible, the surgeon must determine the water and salt requirements as best as he can from clinical observations and laboratory findings. The acid-base balance in an individual

is maintained in the body fluids by the electrolytes that are present inside and outside the cells. The chief electrolytes in the cells are the kations, calcium and magnesium, and the anions, phosphates, sulphates and protein molecules. The predominant ions in the tissue fluids are the sodium kations and the chloride and bicarbonate anions.

Free interchange between the tissue fluid and the plasma through the capillary membrane separating them is possible. The protein molecule alone remains imprisoned within the cells in health. The acid-base equilibrium in the body will be upset if the patient is not able to take in fluids as in cases of severe dysphagia or deep coma, or retain them as in cases of vomiting or continuous gastric suction, or excrete them as in certain diseases of kidney or obstructive lesions in the urinary tract.

Coller and Maddock (1940) have suggested a means of calculating the quantity of fluid to be given to a surgical patient every 24 hours

TABLE A.

1. Water lost by vaporisation and sweating	..	1000-1500 c c.
2. Water for urine	..	1000 c.c.

When the weather is a little hot and humid or when the patient has fever or hyperthyroidism, water lost through vaporisation will be about 2000 c.c. and water for urine 1500 c.c This amount of fluid which varies from 2000 to 3000 c.c. is required by a surgical patient If he is getting dehydrated after operation, more fluid has to be given to combat the dehydration.

Water Balance

Water is excreted mainly by the kidneys; some of it is lost by way of the lungs, sweat glands and faeces. For elimination of waste products by the kidney, water is an absolute necessity and the minimum daily requirement is about

500 c.c.; Table A shows the amount of water necessary for a person at rest in bed. A further requirement of water is necessary after operation especially so if there is an abnormal loss from gastric suction, intestinal fistula or vomiting. Roughly the total daily requirement for a patient will be in the region of 2,000 c.c.

The signs and symptoms of pure water depletion are:—

1. Cellular dehydration associated with intense thirst;
2. decreased urinary volume.

Plasma chloride is normal and blood urea is raised only slightly. Plasma volume, blood viscosity, blood specific gravity and blood pressure remain normal till late.

If the urine shows a high specific gravity and if it is scanty, then the intake of water should be increased. If oral intake is not allowed or is not possible, then it should be given by the intravenous or rectal route.

Water balance in children

Gamble (1947) estimated the water losses of a 7 kgm. infant as shown in table B.

TABLE B.

Vaporisation (lung and skin)	..	200 c.c.
Minimum urine	..	100 c.c.
Total	..	300 c.c.

As the concentrating power of the kindney is poor, the infants require more fluids to excrete all the metabolites. Hence the infants require more fluid in proportion to their body weight than do adults. This particular problem has interested every pediatrician and to-day, water and salt depletion in a child is doubly important because of its profound effect on the blood chemistry and health.

10

Salt Balance

Salt depletion is often met in cases of intestinal obstruction or when the surgeon has employed a gastric suction after abdominal operation. Salt depletion is characterised by: (1) extracellular dehydration; (2) absence of thirst; (3) increasing lassitude, (4) orthostatic fainting; (5) severe vomiting and (6) cramps. Urine volume remains normal till late but does not contain sodium chloride at all. Plasma chloride is diminished, blood urea rises; there is diminution in plasma volume and increase in haemo concentration associated with a severe fall of blood pressure and signs of peripheral circulatory failure.

If the patient is able to take fluids orally, then the salt imbalance can be easily corrected. In those cases where it is not possible, one of the chief methods adopted for rapid absorption is through the intravenous route. The amount of salt required has to be calculated and, if overdosage is done, it will result in acidosis and tissue oedema. When the kidneys are healthy, the excess salt can be excreted provided there is enough water available. If the renal function is not good, the condition of acidosis and tissue oedema will be aggravated.

Salt deficiency can be easily corrected if the urinary chlorides are estimated regularly and this should be done whenever the patient is getting saline intravenously.

In making good, salt deficiency in an average surgical case, it is safe to rely upon estimation of urinary chlorides and to continue saline administration until they are present and maintain an appreciable quantity as determined by the silver nitrate test of Fantus.

The test described by Fantus is as follows:—10 drops of urine are placed in a test tube and one drop of 20% potassium chromate solution is added. 2·9% silver nitrate solution is then added, a drop at a time, and the test tube is shaken after each drop. The end point is a colour change from yellow to brown. The number of drops needed to produce this

change gives the concentration of chlorides in the urine expressed as grams of sodium chloride per litre. Thus 6 drops denotes 6 gms. per litre.

This very simple test is most useful not only in diagnosis but also in the determination of treatment. When used for diagnosis, chlorides should be regarded as absent if the end point colour change occurs within the first drop. This may happen in normal persons if the urine is very dilute because a large amount of fluid has been taken; but if it occurs in the absence of diuresis, it is indicative of salt depletion though the depletion may not have reached a degree sufficient to cause symptoms. In concentrated urine with a specific gravity of more than 10·16, less than 8 gms. per litre suggests depletion. If the urine contains 5 gms. per litre or more, then the patient is unlikely to be suffering from salt depletion.

The normal blood chloride is about 560-630 mgms % as sodium chloride. The blood chemistry investigations like blood urea, alkali reserve and chlorides should be done before and after operation, especially abdominal operation, where the alteration in blood chemistry is likely to occur due to deficient oral intake and consequent dehydration. The following formula is usually adopted to bring the blood chlorides to a normal level: 0·5 gm. of salt per kgm body weight for every 100 mgms that the plasma chloride level needs to be raised in order to reach the normal level A pint of normal saline contains about 4½ gms. of salt and the number of pints of saline needed to restore the blood chlorides to normal is calculated: e.g., if a man's weight is about 70 kgms. and his plasma chloride is about 460 mgm %, then to bring it to the normal level, i.e., 560 mgm %, the person requires:

$$70 \times 0{\cdot}5 \times \frac{\begin{array}{c}\text{Normal plasma}\\ \text{chloride level}\\ \text{i.e., 560}\end{array} \quad \text{minus} \quad \begin{array}{c}\text{Plasma chloride}\\ \text{of the patient}\\ \text{i.e., 460}\end{array}}{100}.$$

i.e., $70 \times 0{\cdot}5 \times 1 = 35$ gms.

Since 1 pint of normal saline contains 4½ gms, the patient requires 35 ÷ 4½, i.e., about 7—8 pints, to restore the blood chloride to the normal level. This fluid can be administered as 5% glucose saline so that the patient may also have the necessary calories for the body.

This amount of saline cannot be given in a 24 hour period but will have to be spaced in such a way that the blood chlorides are restored to a normal level in about 2 or 3 days. As the estimation of blood chlorides takes time, a rough and ready method, the Fantus test, could be used as a guide for proper intravenous therapy in the post-operative period of the patient.

Alkalosis: This may occur in the following conditions:—

(i) Intensive alkali treatment for a case of peptic ulcer.

(ii) Duodenal obstruction.

(iii) Severe vomiting

(iv) Acute dilatation of stomach.

(v) If the patient is having a continuous gastric suction, the patient loses a lot of chlorides and he may go into a stage of alkalosis.

The symptoms of alkalosis are as follows: Headache, nausea, vomiting, dizziness, vertigo, muscle twitching, joint ache, rapid and shallow respirations; patients become apathetic, drowsy and finally tetany develops.

The blood chemistry studies will reveal the degree of alkalosis present. The normal CO_2 combining power of blood in health, ranges from 55-75 volume %. If the CO_2 combining power passes upto 80 or 90 volume %, the patient is likely to develop tetany. When the CO_2 combining power falls below 40 volume % the patient develops acidosis.

In the absence of tetany, alkalosis is best treated with intravenous saline therapy. If there is tetany, 5% calcium chloride intravenously or 10% calcium gluconate should be given in addition to saline intravenously. 10 to 20 c.c. may be required every 8 hours.

Acidosis: This may occur in cases of:

1. Intestinal or biliary fistula,
2. Ketosis,
3. In cases after transplantation of ureters into the colon. (Hyperchloremia develops due to absorption of chlorides from the urine that stagnates in the bowel).

The symptoms and signs of acidosis are:—

1. Deep sighing respiration,
2. Tachycardia,
3. Fall of blood pressure,
4. Abdominal cramps.

In severe cases, the patient becomes comatose and the breath smells of acetone, especially when associated with severe starvation.

Treatment for acidosis. If the CO_2 combining power is between 40 and 55 volume %, Ringer's solution is preferred to saline because solutions of sodium chloride have been shown to be relatively acid when compared to blood. When CO_2 combining power is between 25 and 40, volume %, the patient has severe acidosis and Ringer's solution or 1/6th molar sodium lactate solution should be administered intravenously. The dosage is calculated by using the Kagan's formula:

$$\left[\begin{pmatrix}\text{Normal } CO_2\\ \text{combining power}\\ \text{of blood}\end{pmatrix} - \begin{pmatrix}CO_2\text{ combining}\\ \text{power of blood}\\ \text{in patient}\end{pmatrix}\right] \times \begin{matrix}\text{Body weight}\\ \text{in lbs.}\end{matrix}$$

$=$c.c. of 1/6th molar sodium lactate solution required.

For example, if the patient's CO_2 combining power is 35 volume % and the body weight is 100 lbs., then

$(55-35)\times 100$ lbs. $=2000$ c.c. of 1/6th molar sodium lactate solution.

If the patient's CO_2 combining power is less than 15%, then 5% sodium bicarbonate solution should be given and the formula is:

$(55 - CO_2) \times$ Body weight in lbs. $\times 0{\cdot}24 =$ c.c. required of 5% sodium bicarbonate solution.

Conclusion: The treatment of dehydration and chemical imbalance consists in administration of Ringer's solution or 5% dextrose in water or 5% glucose in saline. Saline solutions correct the simple alkalosis of pyloric obstruction. Acidosis may be treated by solution of sodium lactate or in the presence of hepatic insufficiency by sodium bicarbonate. The daily total volume and specific gravity of the urine best reflects the water needs With a normal renal function and a urinary output of 1000 c c., determination of the urinary chlorides by the Fantus test provides an index of further sodium chloride requirement. Blood chemistry check-up should be done and only after it has been restored to normal *level can operation be safely performed. Fluids can be* administered parenterally during operation and a 5% solution of dextrose in water is the best. More than 1000 c c. is seldom necessary and sodium chloride solution should not be given then Renal function is usually depressed for the first 24 to 48 hours and administration of saline unnecessarily burdens the depressed kidney. On the day of operation, intravenous fluids should be limited to blood in sufficient quantities to replace that which is lost and a 5% glucose in water sufficient to replace the water loss which is approximately about 1500 to 2000 c.c. During the post-operative period, fluid and electrolyte requirements depend upon the patient's progress and the amount lost due to gastric suction or deficient oral intake.

Potassium Deficiency in Surgical Patients

Its recognition and management. Large amounts of potassium are lost when gastric suction or drainage of fluids from the biliary tract and the upper intestines is adopted or in cases of alkalosis. Potassium loss also occurs after operation due to the increased activity of the suprarenal cortex which results in protein ketabolism as shown by increased nitrogen

and uric acid excretion in the urine. (The increased activity of the adrenal is shown by raised 17 Ketosteroid content of urine). Along with nitrogen and uric acid excretion, the potassium which is in combination with protein now being freed gets also excreted.

Unlike the case of sodium, there is no renal mechanism which conserves body potassium. So when the patient has a potassium depletion, the loss of potassium in the urine continues and signs of potassium deficiency become manifest very soon. The signs and symptoms are:—

1. Extreme muscular weakness.
2. Cardiac irregularity.
3. Paralysis of accessory muscles of respiration and atony.
4. Coma.

Low amplitude of T wave and lengthening of Q-T interval in the E. C G. are noted and when serum potassium is 2·6 m. Eq. or below, hypopotassaemia is said to be present.

After the diagnosis is established, therapy should be instituted at once Oral administration of potassium is more effective and safer than intravenous injection. Potassium chloride should be given in doses of 5—15 gr. in tablets up to 60 grains. It can be given in fruit juice. Intravenous injection of potassium is potentially dangerous and should not be given at rates greater than 12 c.c. per minute. (The solution should contain not more than 2 gms. of KCl per litre and with a maximum daily dose of about 4 gms. of KCl. Cardiac arrest is the main danger and one has to be very careful. Post-surgical hypo-potassaemia is best treated by prophylactic administration of 1—2 gms. of KCl daily).

Potassium lactate solution developed by Darrow is useful for replacement of electrolyte. It contains;

Sodium chloride	..	4 gms.
Potassium chloride	..	2·7 gms.
Molar sodium lactate	..	52 c.c.
Water to	..	1,000 c c.

Potassium deficit may be so large that it cannot be restored in less than a week's time. This solution may be given subcutaneously. If given intravenously, it must be diluted with 5% dextrose in water in the ratio of 1:3. As a result of therapy, E. C. G. changes are the first to revert to normal. If too much of potassium is given, it may cause a cardiac arrest.

Hyperpotassaemia occurs almost exclusively when renal excretion is greatly diminished because of renal disease or oliguria accompanying shock and dehydration. The symptoms are numbness, tingling of extremities, bradycardia, flaccid paralysis and uraemia and eventual cardiac arrest.

Peaking of the T. waves and increased duration of P-R intervals and cardiac arrest are the chief features.

The treatment consists in giving (1) intravenous administration of dextrose; (2) Testosterone injection; (3) Peritoneal lavage or Kolff's artificial kidney.

CHAPTER 9

ANAESTHESIA

The advances made in surgery in recent years owe not a little to the advances made in anaesthesiology. This at last has become a special field and there is little doubt that the two specialities are interdependent. In olden days, the surgeon had only to consider the general inhalation anaesthetics like ether, chloroform, Nitrous Oxide and Oxygen. In the light of the advances made in the field of anaesthesiology, the surgeon and the anaesthetist have a joint responsibility in surgical procedures. The anaesthetist has to determine in consultation with the surgeon the type of anaesthesia so that it will cause the least physiological disturbances to the patient.

The role of the anaesthetist in the care of the surgical patients can be considered under the three headings:

(1) Pre-operative; (2) Operative; and (3) Post-operative care.

Pre-operative Care: Every surgical patient should be seen by the anaesthetist at least two days before the patient is posted for a major operation. Two days of hospitalisation is necessary for the anaesthetist to study the patient in all aspects. The anaesthetist should also carefully review the history and physical findings He should also find out whether all the investigations have been done and what bearing they will have on the type of anaesthesia that he is proposing to give The cardiac and respiratory condition of the patient should be noted by the anaesthetist and the pre-anaesthetic interview will give him a clear picture whether the patient will be a nervous individual or not. Preliminary medication will be done by the house surgeon working under the anaesthetist and the anaesthetist should leave complete instructions the previous day.

Preliminary Medication

Most patients may not have sleep at night due to fear of the operation. Sedatives in the form of Sodium Pentabarbital gr. 3 or Phenobarbitone gr. 2 at bed time will go a long way in relieving the emotional strain and this hypnotic will give him a good night's sleep. Additional medication is done in the morning so that the patient goes to the operation room without fear. This pre-anaesthetic medication prevents psychic shock and reduces the quantity of the anaesthetic agent required.

The usual pre-medication drugs are:—

1. Morphia, gr. 1/6 to 1/4, is usually injected hypodermically 1 to 1½ hours before induction. When injected intramuscularly, its maximum depressive effect on respiration occurs in 30 to 40 minutes and when given intravenously, in 3 to 7 minutes. It relieves pain, decreases anxiety and lessens the tendency of the patient to become excited or delirious or to struggle during induction. This leads to a smoother, more rapid and safer induction and decreases the amount of anaesthetic needed to produce surgical anaesthesia The great disadvantage with morphia is that it alters the pupillary sign which is an important guide to the stages of anaesthesia.

2. Atropine hypodermically in doses of 1/200 to 1/100 gr. This reduces the secretions and its maximum effect is noted in about an hour and a half.

Scopolamine 1/200 to 1/100 gr. like atropine also inhibits secretions but has an advantage in that it produces psychic sedation. These drugs are administered subcutaneously and their effect is seen within 20 minutes, and either of them can be combined with morphia

3. Barbiturates are usually given to allay fear before operations. They also protect against toxic reactions of local and spinal anaesthetic drugs. These drugs can be given orally or intramuscularly or intravenously. Pentabarbitone, gr. 2, may be given at bed time the day before operation and in the

morning of operation. Nembutal or any of the short acting barbiturates can be given 2 to 3 hours before anaesthetisation.

Basal Anaesthetics: Avertin is administered rectally in doses of 0·1 G/KG body weight. The night before the operation, the patient gets a soap and water enema and in the morning the avertin mixture is given per rectum. Many anaesthetists combine a barbiturate with morphia and scopolamine as a part of the pre-anaesthetic medication and administer it 1 to 2 hours before an anaesthetic is to be given.

Diet: The patient can have fluids upto midnight. As far as dinner is concerned, the surgeon in charge should leave specific instructions as to what sort of diet the patient should have depending upon the operation. Nothing should be given by mouth after midnight. But if the patient is to be operated in the afternoon, he may have coffee or orange juice at about 5 or 6 A M in the morning.

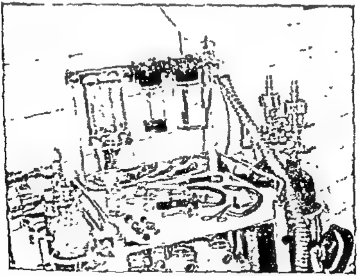


Fig. 18. Boyles anaesthesia machine with equipment for endotracheal intubation.

Pre-medication in Children: Children rarely need a soporific the night preceding operation. The dosage of Atropine

varies according to the age of the child. Under two years, the child gets a dose of about 1/200th grain and this drug is absolutely essential to prevent excessive salivation during and after operation. A dose of 1/150 gr. is suitable for a child between 2 and 6 years; and over 6 years, the dosage may be 1/100 gr.

Morphia is badly tolerated by infants and children and the dosage should be 1/40 gr. per stone of body weight. It is better not to give it to infants below 1 year but after the age of 4, the dosage suggested may be given. About 1/16th grain of Morphia is given hypodermically for a 4-year child and after the age of 8, the dosage is increased slowly to 1/8th grain.

Nembutal is well tolerated by children. By mouth, the dosage can be 0 6 grain per stone of body weight subject to a maximum of 2½ grains. Chloral hydras is also a very safe drug and an efficient pre-operative sedative.

FIG. 19. *Guedel's airway.*

There are various types of anaesthesia available and the selection of it will depend upon:—

1. The nature of the operation;
2. the age of the patient;
3. general condition of the patient,
4. the experience of the anaesthetist.

Before administering an inhalation anaesthetic, the following should be at hand:—

1. Mouth gag; 2. Tongue forceps to draw the tongue forwards; 3. Pharyngeal (Guedel's) airway; 4. Endotracheal tube and laryngoscope.

Just before the induction of a general anaesthetic, any false teeth should be removed, dose and time of premedication should be checked, and whether the patient has taken food or not must be inquired into.

The inhalation anaesthetics used are:—

a. Open ether; b. Semiclosed ether; c. Nitrous oxide and oxygen and trilene; d Vinesthene or Divinyl ether.

Some of the complications that occur after inhalation anaesthesia are as follows:—

1. Pulmonary complications. This may be:
   - a Bronchitis;
   - b. Atelectasis, lobular or lobar;
   - c. Broncho-pneumonia;
   - d. Pulmonary embolism.

When the patient has rapid breathing, slight cyanosis and restricted movement of one side of the chest, atelectasis has to be thought of. Diminution of breath sounds with decreased resonance and mediastinal displacement towards the affected side should also suggest the possibility of atelectasis. In the case of pulmonary embolism, sudden pain in the chest at any time between the 2nd and 14th day after operation with profound shock, sweating, pallor, air hunger and anxiety must arouse the suspicion of such a catastrophe. Death usually follows quickly but recoveries have been reported.

Chest complications can be prevented by pre-operative care which consists in clearing up any infections in the upper respiratory tract and attending to oral hygiene. Smoking should be avoided for three weeks before operation. At

operation, over-sedation should be avoided and a careful anaesthetic technique employed. Upper air passages should be cleared of all secretions, blood, vomitus, etc., during and after operation by the use of a sucker or by the use of a bronchoscope, if there is too much of bronchial secretions.

In the post-operative period, excessive sedation should be avoided and the patient should move about in bed as early as possible. Deep breathing and coughing at least once each hour should be encouraged. Prevention of pulmonary embolism involves frequent post-operative movements of the legs, feet and toes. If the patient has a Homan's sign, i e , pain in the calf on dorsiflexion of the foot or a low fever after a pelvic operation, thrombophlebitis should be suspected. The prothrombin level should be determined and Heparin or Dicumoral should be given

If the patient develops bronchitis, sulphonamides or antibiotics should be given and an expectorant or sedative mixture may be required. Inhalation of steam with Menthol or Tr. Benzoin Co. is soothing in cases of tracheitis

In cases of atelectasis, the patient should be made to turn from side to side in bed every hour, and encouraged to take deep breaths. He should be made to cough so that the plug of mucus that is blocking the bronchus may be dislodged. If this treatment is not successful, a bronchoscopic suction should be carried out. The greatest danger of atelectasis is that it may be followed by broncho-pneumonia or lung abscess

8 Gastro-intestinal complications :—

This will depend upon :

a. The anaesthetic agent and technique employed. When ether, cyclopropane or trilene are used, the nausea and vomiting will be greater than when Pentothal Sodium, regional analgesia or gas and oxygen are employed. Hypoxia also predisposes to vomiting.

b. *Condition of the stomach* If the stomach is full, vomiting is more likely to occur after the use of inhalation anaesthetics.

c. Administration of fluids by the oral route immediately after operation may also cause vomiting.

Post-operative thirst in these cases is treated by the intravenous administration of saline or glucose and water.

Persistent hiccough may follow after general or regional anaesthesia. The treatment consists in:

1. Periodic inhalation of carbon dioxide;
2. sedatives;
3. blocking of phrenic nerves either unilateral or bilateral with 15 to 20 c.c. of 1% procaine injection in resistant cases.

3. Another important complication, when employing ether as an inhalation anaesthetic, is the occurrence of convulsions. Ether convulsions have been reported with increasing frequency since 1926. The exact cause of it is not known but many factors have been held responsible: For example, overdosage of ether, impurities of ether, cerebral congestion, calcium deficiency, carbon dioxide excess, atropine excess and warmth and humidity of the operating theatre.

The treatment of this condition is as follows:—

a. Using oxygen with 5% of CO_2 and withdrawing ether.
b. In some cases, pentothal sodium should be injected intravenously in doses of 0 2 G to control convulsions. Overdosage of this drug may produce dangerous depression of the respiratory centre.
c. Head of the table is raised and carotids are compressed temporarily to reduce the blood supply to brain
d. In the post-operative period, cold compresses to the patient's chest and head are given to prevent hyperpyrexia.

Spinal Analgesia

The choice of drug depends upon (1) the level of anaesthesia required; (2) the duration of operation. Nupercaine

in solutions of 1 in 200 and 1 in 1500 are used. In operations of upper abdomen like gastrectomy, cholecystectomy, a hypobaric solution, 1 in 1500 Nupercaine, is administered. For operations on the perineum, lower abdomen and lower extremities, a hyperbaric solution, 1 in 200 Nupercaine, is administered.

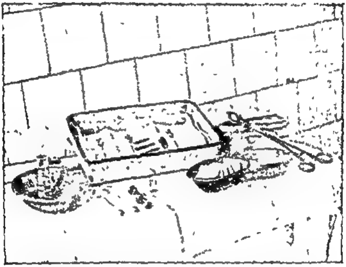


FIG. 20 Spinal Analgesia Equipment (1) Kidney Tray containing Light Nupercaine 1 in 1500 ampoule and Heavy Nupercaine 1 in 200 ampoule; (2) Sterile Towels, (3) Rectangular Tray containing (a) Sterile Files to break the ampoules (b) Howard—Jones' Spinal needles (c) Syringe to fit the Spinal needles. (4) Spinal needle and Syringe loaded with the heavy Nupercaine. (5) Kidney Tray containing Sterile wipers. (6) Sponge holding Forceps on a Delf-pot containing Acriflavine in Spirit.

There is a third type of spinal anaesthesia known as continuous or fractional spinal anaesthesia. This was introduced by Lemmen in 1941. The period of anaesthesia is prolonged by adding to the initial dose of the agent, small amounts of the anaesthetic.

Premedication is necessary before spinal anaesthesia is given. With this end in view, Nembutal in doses of 1½ to 3 grs. is given a couple of hours before operation or 1/4th

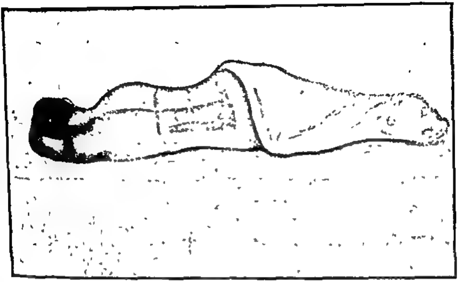


FIG 21a. Incorrect position of patient for spinal anaesthesia

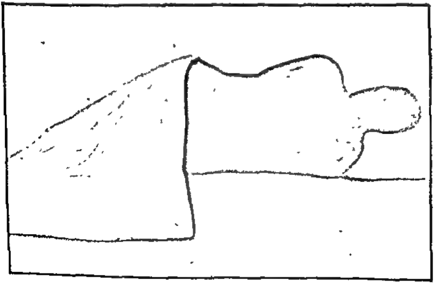


FIG. 21b. Correct position of patient for spinal anaesthesia

to 1/6th gr. of morphia with atropine or scopolamine 1/150 gr. may be given one hour before operation.

Technique of Lumbar Puncture and Spinal Analgesia

1. The patient should be in the lateral position except for operations on the perineum.

2. Back to be at the edge of the table and parallel to it.

3. Patient should arch his back fully and flex his knees on to the abdomen.

4. Head to be brought down to touch the knees. Hip and shoulder to be vertical to the table to avoid rotation of the vertebral column.

5. The highest point of the iliac crest should be noted by the anaesthetist and this point passes over the 4th lumbar spine or the interspace between the 4th and 5th lumbar vertebrae.

The anaesthetist, after thorough washing of his hands, wears a sterile gown and puts on sterilised gloves. The lumbar puncture needle is then pushed at right angles to the back which has been surgically prepared, either through the interspace between the 3rd and 4th or 2nd and 3rd vertebrae. A successful puncture is followed by a free flow of cerebro-spinal fluid on withdrawal of the stylet. Blood and cerebro-spinal fluid might sometimes come through the needle in which case the needle may be adjusted or withdrawn. If pure blood comes, the needle must be withdrawn and another attempt made.

All patients receive 30 to 40 mgms. of ephedrine or 15 to 20 mgms. of methedrine intramuscularly to combat the fall of blood pressure that occurs in these cases of spinal anaesthesia. This dose is repeated during the operation if the systolic blood pressure falls below 90. If the blood pressure still does not rise, the patient is given intravenous glucose saline or, better still, whole blood. Oxygen should be given freely to the patient during the spinal anaesthesia. The patient's

respiration as well as blood pressure should be watched very carefully during the whole period of anaesthesia.

Heavy spinal: A hyperbaric solution of 1 in 200 Nupercaine is used and the anaesthesia will go up to the level of T10 or T11 with a dose of 1.4 to 1.6 c.c. In cases when the level of anaesthesia should go to T7 or T8, 1.75 c.c. should be given and the patient placed in the supine position after the lumbar puncture with the table tilted about 2½ to 5 degrees Trendelenberg. The most important precaution is that the head and the shoulder should be raised so that the anaesthetic agent does not go higher than T7 vertebra.

Hypobaric spinal: Howard Jones technique. Nupercaine in strengths of 1 in 1500 is used. With the patient in the lateral position, the lumbar puncture is done between L2 and L3. A rough guide as to the amount of the anaesthetic agent required is as follows:—

10 to 11 c.c. if the anaesthesia is to extend upto T10; 11 to 12½ or 13 c.c. for anaesthesia upto the level of T7. After injection of this drug, the patient is rotated from the lateral position on to the face to ensure the soaking of the posterior roots. The patient is then returned to the supine position after 5 minutes with the table in slight Trendelenberg position which is maintained throughout the operation. There should be no pillow under the head. Immediately after administering the drug through the needle, 45 mgms. of ephedrine is given intramuscularly.

The post-operative care, after such an anaesthesia, would be to keep the *patient in Trendelenberg position* for the first 6 hours, the foot of the bed being raised by 10″ with blocks placed underneath.

Spinal anaesthesia is contraindicated in the following conditions:—

1 Severe shock; 2. hypertension; 3. marked obesity; 4 low blood pressure; 5. advanced cardiac and respiratory disease; 6. disease of the C.N.S.; 7. Deformities of the spine and infections in the lumbar region.

In obstetric practice, spinal anaesthesia is attended with risks and therefore not favoured by many obstetricians. Spinal anaesthesia can be used in urology, especially in cystoscopic and transurethral procedures.

The complications after the spinal anaesthesia are:—

1. On the table.

a. Fall of blood pressure which, if not noticed and appropriate measures taken, may lead to collapse and death of the patient.

b Respiratory paralysis, leading to death if artificial respiration is not resorted to when respiratory difficulty is observed.

c Severe anoxaemia which may contribute to shock.

2. During the first 48 hours after the anaesthesia.

a. Headache, b retention of urine; c. backache; d distension

3. During the first week.—Meningitis.

4 Remote complications:—

a. Trauma to the vertebral column

b. Trauma to spinal cord and its effects, namely, various types of paresis and paralysis, incontinence of sphincters or even permanent spastic paraplegia may occur.

Headache, after spinal anaesthesia, is of two types:—

a. Associated with high C S.F tension,

b. Associated with low C S F. tension.

If the patient is made to sit up and the headache decreases, it is due to high C.S F. tension. But if it increases, it is due to low C.S F tension.

Fractional Spinal Anaesthesia

By this method of anaesthesia, the operation can be continued for an indefinite length of time. For this procedure,

the patient has to lie on a special mattress. Since there is a gap in the mattress, the patient can lie in the supine position with the lumbar puncture needle jutting out, which is connected to a rubber tubing for administering the spinal anaesthetic. An average of 15 mgms. of Novocaine is required every half an hour to maintain analgesia.

Extradural Sacral Block

Blockage of nerve roots between the dura and the vertebral canal. This was first introduced by Catheline in 1901.

Technique: Nupercaine 0·2% solution is used for extradural block. The maximum dosage is about 60 c.c. to which Adrenaline solution is added in the usual proportion. The patient is put in the lateral position and the first or second lumbar interspace is chosen for the insertion of the needle. After the needle has pierced the ligamentum flavum, it is stopped and the following points noted to find out whether the needle is in the extradural space.

1. Sudden loss of resistance in the advancing needle.
2. Injection of a little saline through the needle shows the sudden ease with which the solution enters into the extradural space.
3. Withdrawal of hanging drop of saline on hub of needle.

The injection must commence only when the needle is in the extradural space. A test injection of 10 c c. is made and if in 5 minutes, there is no evidence of subarachnoid block, such as inability to move the feet, the remainder of the solution is slowly injected, frequent aspiration tests being made to avoid the risk of subarachnoid or intravenous injection. The patient is then turned on his back and the head end of the table is slightly raised for lower abdominal and pelvic operations. Ephedrine or methedrine is given to combat the slight fall in blood pressure. Evidence of sensory and sympathetic blocks are more evident than of motor block.

20 to 30 minutes must lapse after injection before the patient gets complete analgesia.

The advantages claimed by the above method are:—

1. Less fall in blood pressure.
2. Less danger of meningitis
3. Absence of post-operative headache and urinary retention.
4. Prolonged analgesia upto 6 hours.

The disadvantages are:—

1. Muscular relaxation is not always adequate.
2. Difficulty of being sure of the position of the needle point in the extradural space and risk of subarachnoid injection.

This type of anaesthesia may be given for operations like hernias, appendicectomies and perineal operations.

Intravenous Anaesthesia

Pentothal Sodium or any short acting barbiturate can be used for operations of less than 30 minutes duration. The concentration of Pentothal Sodium used is either 2·5% solution (1 G in 40 c.c of distilled water) or 5% solution (which is 1 G in 20 c.c. of distilled water). Preliminary medication given in these cases will be· Atropine, 1/100th gr. 1 hour before operation and in some cases, it is combined with a little morphia 1/6th gr. Atropine reduces the secretions and the vagal reflexes. After the needle has been passed into the vein, the patient is asked to count as the drug is slowly given. After about 4 to 5 c.c. has gone in, the patient will pass into a state of apnoea and no more of the drug should be given till the patient's respiration returns to normal. Care must be taken by the anaesthetist to see that the airway is free. Oxygen should be given to combat any anoxoemia that may develop. The jaw must be pulled upwards and

forwards by the assistant. Another 4 to 5 c.c. may be necessary to put the patient into the stage of surgical analgesia. Patients may vomit during the pentothal anaesthesia and an empty stomach is preferable before the induction of anaesthesia. Pentothal sodium should be avoided in children under 12 years of age and in all cases where the patient is in severe shock or toxaemia or in those with obstruction in the respiratory passages and tumours of neck which press upon trachea or larynx.

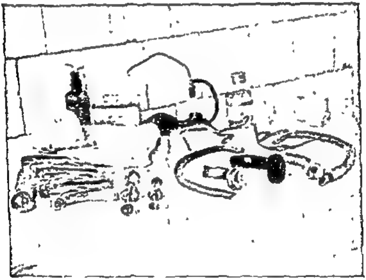


FIG 22 Equipment for endotracheal intubation (1) Laryngoscope with 3 adjustable blades, (2) 20 ccs syringe to contain Thiopentone Sodium 5%, (3) 2 cc syringe to contain Muscle-relaxant (Flaxedil or curare), (4) Endotracheal tube with the Endotracheal union; (5) Waters' Metal airway; (6) Guedel's rubber airway; (7) Oropharyngeal rubber airway (8) Cuffed endotracheal tube with the endotracheal union, and a mosquito artery forceps attached to the side rubber tube; (9) Magill's Endotracheal tube introducer, (10) Nupercainal ointment; (11) Thiopentone Sodium 5 Gm multi-dose container dissolved in 100 cc of distilled water to make a 5% solution, (12) Flaxedil 80 mgms in 2cc ampoule; (13) Delf pot containing Acriflavine in spirit, with sterile wipers, (14) Rowbotham's Throat Spray containing 0·1% Pontocaine or 1% xylocaine; (15) Face-pad with Schimmelbusch's Ether mask; (16) Vinesthene (M & B) ampoules for induction; (17) Bottle containing Ethyl Ether.

The use of Curare in anaesthesia:

This is used in addition to an anaesthetic to produce complete muscular relaxation. After pentothal administration, an endotracheal tube can be slipped in easily by giving a small dose of Curare intravenously.

For abdominal operations, especially when the effects of spinal anaesthesia are wearing off, or in cases where the patient is given pentothal sodium and gas and oxygen, a small amount of this drug intravenously brings about complete relaxation of the peritoneum. Usual dose is about 15 mgm. intravenously. This drug can be used even in patients with impaired liver and kidney function. The pharmacological antidote is prostigmine 2½ mgms. of a 1 in 2000 solution given slowly intravenously to check the respiratory depression or paralysis. Curare must never be used unless the anaesthetist is equipped to perform artificial respiration and rapid tracheal intubation.

Local Anaesthesia

The various methods of local analgesia are:—

1. Infiltration analgesia.
2. Field block.
3. Nerve block.
4. Refrigeration analgesia.
5. Topical or surface analgesia.

Premedication: Adequate premedication is essential for successful local analgesia in major surgery. A barbiturate *has to be given to prevent possible toxic effects from the* drugs used. Adrenaline is usually added to the local analgesic solution to delay absorption and also to prolong their action

The most satisfactory local anaesthetic is procaine in strengths of ½ to 1%. About 200 c.c. of the ½% solution can be safely injected without producing toxicity. Care should be taken to see that the local analgesic solution does not enter

into the vein by repeated aspiration tests as the solution is being injected. Preliminary sodium pentabarbital is given to reduce the toxic reactions. In some cases, dangerous reactions are likely to occur and the patient may get convulsions or cardiovascular collapse.

Convulsions: This may come in within 10 minutes after injection and the patient very soon loses consciousness and respiratory paralysis sets in. Immediate treatment is necessary to save the patient.

Cardiovascular collapse may sometimes occur due to intravascular injection of procaine. The treatment of this condition should be energetic and at the same time systematic. Unnecessary time will be lost if one does not proceed systematically. If the patient has a collapse, 50 c.c. of a 25% glucose is given intravenously; methedrine 20 mgms. may be given intramuscularly as also oxygen administered through an endotracheal tube. If convulsions have occurred, about 2 to 5 c.c. of a 2·5% solution of sodium pentothal must be given intravenously and if respirations have stopped, an endotracheal tube must be passed to give 100% oxygen with the help of a rebreathing bag. Local anaesthesia should not be used in regions where there is infection. In cases of toxic thyroids and hypertensive subjects, local analgesic solution without adrenaline should be used.

Refrigeration Analgesia

A useful method of analgesia is advocated by F. M. Allen of New York city. This type of analgesia is indicated for amputations of the leg, when arteriosclerotic or diabetic gangrene is present. Mortality is strikingly reduced by this type of anaesthesia. Absence of post-operative pain and shock are noted in this method The patient's general condition is also not affected. The duration of refrigeration depends on the bulk of tissue. The limb is covered with ice bags and immersed in a bucket of ice and water. When the skin temperature has been reduced to 5 degrees, the operation can be done.

Anaesthesia for Abdominal Surgery

Good muscular relaxation is essential for abdominal surgery. Under ideal conditions, with a trained anaesthetist, the choice is a general anaesthetic. Induction is done with half a gram of Pentothal sodium and 15 mgms. of Curare in an adult. The patient is then intubated and further anaesthesia is maintained by nitrous oxide and oxygen supplemented with small doses of Curare and Pethedine. Respirations are controlled during the whole length of the operation.

Alternatively, spinal anaesthesia with 12 c.c. of hypobaric solution can be administered by Howard Jones technique in those patients whose general condition is good and blood pressure within normal limits. In poor risk cases, regional analgesia (local) is the anaesthesia of choice. Paravertebral, intercostal, or field block with local infiltration may be done.

Anaesthesia in Thyroid Surgery

Role of anaesthetist in the surgical treatment of thyroid cases:—

These cases have to be seen by the surgeon, physician and anaesthetist jointly. After the patient has been stabilised by medical treatment as shown by the remission of toxic symptoms, the decrease in the metabolic rate and improvement in general condition, the anaesthetist, in consultation with the surgeon, decides on the suitable time for operation. General anaesthesia is selected for all thyroid operations, using nitrous oxide or ethylene. Cyclopropane is not suitable because of the cardiac irregularities that may arise during the administration.

Avertin as a basal narcotic is given 20 to 40 minutes before the anaesthesia and the anaesthetist should be there watching the patient's respirations. Pentothal has been used by some anaesthetists for induction and after the endotracheal tube has been slipped in, the anaesthesia is continued under nitrous oxide and oxygen and ether or trilene. Some surgeons use Avertin as a basal narcotic and supplement it

with local and regional infiltration with 1% procaine. Thyroid operations can also be done by local block in co-operating patients. Patients, who have severe degree of exopthalmos, may develop corneal ulcerations. To prevent it, an antiseptic ointment is applied and the eyes are usually covered. Bleeding is likely to be severe during thyroid surgery and intravenous administration of blood or fluid should be given to combat the fall of blood pressure.

Post-operatively, the patient may have plenty of mucus in the throat which must be sucked out before the patient is sent to the ward. The endotracheal tube is left in place till the patient recovers consciousness and just before removal, the mucus present in the trachea and larynx must be completely sucked out by the anaesthetist.

Serious respiratory obstruction may occur as a result of haemorrhage or due to bilateral paralysis of vocal cords or due to oedema of the vocal cords. In these cases, the immediate opening of the wound and inspection or tracheotomy may save the individual. There should be no hesitation in performing tracheotomy on any patient with evidence of increasing post-operative respiratory obstruction.

Anaesthesia for operations on the head and face:—For operations like craniotomies (anterior or posterior cranial fossae), operations on the mouth, face and jaw, mastoid operations or pharyngeal surgery, trigeminal resections and other types, the anaesthetic of choice is endotracheal nitrous oxide, oxygen and trilene. For poor risk patients, local anaesthesia is used.

Operations on the lower extremities and perineum:—Spinal anaesthesia is one of choice in operations on lower extremities. Alternatively, any type of general anaesthesia can be administered

For *operations on the upper extremities*, gas and oxygen supplemented with trilene or ether is given or a brachial block is an alternative to general anaesthesia.

For children, open drop ether is preferable or endotracheal anaesthesia for major operations.

Rectal operations—Spinal anaesthesia is usually given.

Gynaecological operations—Spinal anaesthesia or general anaesthesia with ether, with or without muscle relaxants is used.

Thoracic Surgery: Operations on thoracic wall are best done under intercostal block.

Intrathoracic operations like lobectomy, pneumonectomy or cardiac surgery are done under controlled respiration techniques which require trained anaesthetists. *In a few cases, intravenous drips of procaine will be necessary to control the irregularities of the heart.*

Cardiac Arrest

Cardiac standstill, occurring suddenly during an operation, is an event in which both the anaesthetist and the surgeon are intimately concerned. The first recorded death under anaesthesia occurred during an operation for removal of a toe nail in 1848. More than hundred years have passed and the problem of cardiac arrest still remains to be solved. Cardiac arrest occurs more often in children below the age of 10.

The diagnosis of this condition is always first made by the anaesthetist and it is he who notifies the surgeon for immediate treatment. A careful watch of the patient must be maintained by the surgeon and the anaesthetist during the course of the operation. The most reliable sign is the absence of pulse. Electrocardiogram also is helpful but it may not be available when the emergency occurs

Auscultation of the heart may be an additional method of diagnosing the true state of affairs. If the patient is pulseless or the sounds of the heart are not audible, the treatment should be very energetic. The etiology of this condition is not very definite but there are many factors which play a

part in precipitating this emergency. Deficient oxygen supply, anaesthetic agents, the use of various drugs, and displacement of the heart during thoracic operations all play a part in this catastrophe. Sensitivity to a drug may also produce sudden cardiac arrest as in cases of spinal anaesthesia. Too deep an anaesthesia may produce cardiac and respiratory arrest. Cyclopropane and intravenous barbiturates and conditions which stimulate the vagus nerve may produce a cardiac standstill.

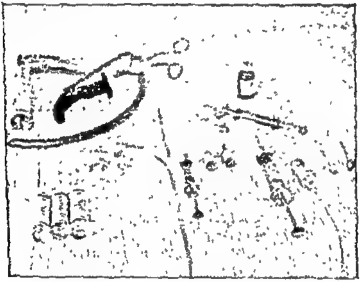


FIG III Cardiac Arrest—Resuscitation Equipment; (1) Laryngoscope, (2) Magill's Endotracheal tube introducer; (3) Endotracheal tube with the endotracheal union, (4) Guedel's rubber airway; (5) 2 cc Record syringe with a spinal needle attached to it, on a sterile wiper.; (6) Procain Amide Hydrochloride in a multi-dose container (100 mgms/cc); (7) Calcium chloride ampoules; (8) 2cc Record syringe with Adrenaline ampoules; (9) 10cc Record syringe with Coramine ampoule and 2 needles.

The number of deaths due to cardiac arrest has steadily increased from 1 in 5000 in 1915 to 1 in 600 in 1952. The predisposing causes are as follows:—

1. Anaemia.
2. Anaesthetic agents.

3. Barbiturates.
4. Transfusion reactions.
5. Myocardial deficiencies.
6. Hypoxemia.
7. Vago-vagal reflexes and other nervous stimuli.

The anaesthetist plays an important role in the detection of cardiac arrest. Slight changes in blood pressure, some alteration of the pulse like brady-cardia (40/minute), a change in respiration, or some degree of cyanosis are the usual premonitory signs for cardiac arrest which an alert anaesthetist can detect.

The prophylactic measures are as follows :—

1. Careful pre-operative management.
2. Careful selection of anaesthetic agent (caution is urged in the use of nitrous oxide and pentothal).
3. Avoidance of too deep an anaesthesia.
4. Prevention of transfusion reactions.
5. Adequate pulmonary ventilation.
6. Prophylaxis and treatment of all irregularities of the heart.
7. Use of local anaesthetics by the surgeon to reduce reflex irritabilities.
8. Gentleness in operation and avoidance of all haste
9. Close co-operation with the anaesthetist and brief reports about the patient's progress during operation by the anaesthetist will greatly reduce the number of cardiac arrests among the patients.

Treatment:

When the operation is being done, the surgeon, by noting the color of the blood, will know the cardio-respiratory status, and efforts should be made by the surgeon and anaesthetist to improve the condition. Cardiac resuscitation should be done within 3 to 5 minutes and if it is delayed, may cause permanent damage to the central nervous system and certain

changes in the psychic behaviour of the patient may occur after recovery.

The treatment of this condition consists in:—

1. Administration of oxygen and maintaining artificial respirations.

2. Circulation is maintained by immediate cardiac massage by the surgeon.

3. Administration of intravenous fluids to the patient.

4. A 10 degree Trendelenberg position should be maintained during this treatment.

5. The use of certain drugs like procaine and epinephrine.

Pure oxygen is given through an endotracheal tube and respiration is maintained through manual compression of the anaesthetic bag. Cardiac massage is done by immediate thoracotomy through the 4th left intercostal space and the pericardium opened and the heart massaged at the rate of 80 per minute. If the patient's abdomen has already been opened, then the massage can be done by the trans-disphragmatic route or by the subdiaphragmatic route. The massage must be gradual and the relaxation abrupt as stated by Gunn. The cardiac massage must be interrupted at short intervals for a few seconds to allow spontaneous beats to develop. Either epinephrine ½ c.c. of 1 in 1000 solution or calcium chloride 3 c c of 10% solution is injected into the right ventricle, if standstill or feeble pulsation is present. Rapid infusion of blood or glucose or saline should be started.

If the patient has ventricular fibrillation, it should be treated satisfactorily by defibrillation with an electric defibrillator. In some cases, injection of procaine 10 c.c. of 1% solution mixed with epinephrine is given intravenously.

Summary:

1. Cardiac resuscitation must be done within 3 to 5 minutes, if it is to be successful.

2. An alert house surgeon or anaesthetist may prevent this delay and help in instituting early resuscitative methods.

3. Artificial respiration with pure oxygen should be given either through an endotracheal tube or by a tight fitting mask.

4. The Surgeon must immediately do a thoracotomy through the left 4th interspace and start cardiac massage.

5. Immediate injection of 1 in 1000 solution of epinephrine in doses of ½ c.c. with 5 c.c. saline should be given into the right ventricle.

6 Ventricular fibrillation is treated by injection of procaine or by the use of an electric defibrillator.

7. Organised team work is absolutely essential to save the patient and everything should be available for resuscitative measures. Every operation theatre therefore should have a table ready with the necessary instruments and needles kept sterilised for immediate use. Drugs also should be available so that no time is lost and there should be no confusion when resuscitating measures are being adopted.

PART II

CHAPTER 10

SURGERY OF THE THYROID AND PARATHYROID

Surgery of the Thyroid

Enlargement of the thyroid gland may be due to simple goitre or toxic goitre. For surgery of this condition, complete co-operation between the surgeon, physician, anaesthetist and nurse are requred. If the patient is having hyperthyroidism, a complete history, a careful physical examination and all the laboratory studies are necessary in the final clinical evaluation and in grading the operative risk in any case.

The pre-operative care is as follows:—

(1) Complete mental and physical rest is necessary for cases of hyperthyroidism The patient must be in bed and is allowed to move about in the evenings for about half an hour in a wheel chair. Relatives are told not to excite the patient by discussing family matters. They are requested not to worry the patient and not to see the patient every day. The house surgeon and the nurse should take the patient into confidence and should always give a sympathetic hearing to his or her troubles, at the same time comforting and assuring the patient that everything will turn out well in course of time. Sleep at night can be ensured by giving mild sedatives like Bromides or Phenobarbitone (1 to 2 gr. at bedtime).

(2) *Diet.* High calorie, high protein, high carbohydrate, high vitamin and low fat diet is given. Most of these patients with hyperthyroidism are emaciated and their food intake is insufficient. The loss of weight is due to the increased rate of metabolism Hence these patients, although they have a voracious appetite, are not able to consume, or they are not

able to secure, the adequate amount for their daily requirements. Hence a high calorie diet is very necessary for such patients. The patient is not allowed to have any coffee, tea or alcohol. Smoking is prohibited. Plenty of proteins, at least 2 to 2·5 gms per Kgm body weight, should be given.

(3) A weight chart should be maintained and the patient should be weighed every third day; a gain in weight is a good indication of improvement.

(4) Patients should be given Multivitamin tablets by mouth and vitamin B parenterally This vitamin B therapy will bring about improvement in the cardio-vascular and gastro-intestinal symptoms. Thus, the patient should have a minimum of 20 mgms Thiamin, Nicotinic acid 20 mgms, Riboflavin 5 mgms and 200 mgms of Ascorbic acid per day. For the anaemia, liver therapy is indicated. In some cases, injections of liver extract should be given and blood transfusion, if necessary, depending upon the degree of anaemia.

(5) *Fluid balance*: Patients with hyperthyroidism lose a good deal of fluids from their body especially when they have marked sweating or diarrhoea A minimum of 2500 c.c. of fluid is necessary every day and, if it cannot be taken orally, then it has to be given parenterally in the form of 5% glucose in distilled water. This will give the necessary amount of fluids as well as the carbohydrates and calories for such toxic patients.

(6) *Drugs*: For toxic cases, the drug of choice is Thiouracil. It can be given in the form of Methyl or Propyl Thiouracil, the dosage being calculated according to the body weight of the patient For an adult, about 200 mgms of Thiouracil three times a day is necessary. The total quantity to be given will depend upon the basal metabolic rate. Roughly it has been calculated that, if the B.M.R. is + 45, the patient requires about 40 days of Thiouracil administration to bring it down to a + 2 or + 3 B M R. During the whole period, the patient should be watched for any evidence of toxicity due to this drug which may be in the form of

leukopaenia, agranulocytosis, oral infection, skin eruptions and periods of pyrexia. After the B.M.R. has been reduced to zero, which takes about 2 to 5 weeks of treatment in these cases, iodine will have to be given before the patient is subjected to surgery. Thiouracil alone is not an ideal drug because it affects only the production of hormone and not the underlying etiology of hyperthyroidism Surgery after thiouracil therapy alone is more difficult because of the increased vascularity of the thyroid. Hence Moore and his associates have suggested that iodine therapy subsequent to thiouracil therapy may play a useful role in reducing the hyperplasia and vascularity.

Lugol's iodine should be given for 10-12 days following Thiouracil therapy. Starting with 5 Mins t.d.s., the dose is increased by 3 Mins. every day till a maximum of 15 Mins. t.d.s. is given. On an average, the patient gets the maximum improvement in about 10 days time after the commencement of iodine therapy. The surgeon, before subjecting the case for thyroidectomy, should examine him thoroughly and judge his condition not only by the fall in the B.M.R. and the pulse rate but on the clinical improvement. No attempt should be made to operate too soon without a consultation with a physician and an anaesthetist. The surgeon should not be misled by the drop in the B.M.R. alone.

Pre-operative investigations are :—

(1) Pulse rate to be recorded every 4 hours and chart maintained.

(2) Blood pressure twice a day.

(3) Weight of the patient twice a week.

(4) Routine blood examination.

(5) Urine examination.

(6) X-ray chest (to reveal or to exclude retro-sternal enlargement of thyroid gland and any cardiac enlargement).

(7) Examination of the vocal cords.

(8) B.M.R.

(9) Blood grouping.

(10) Bleeding time, coagulation time and prothrombin time.

(11) Liver function tests. Quick's hippuric acid test can be done to find out the degree of hepatic dysfunction. Patients with Hepatic dysfunction can be improved by a high carbohydrate and high protein diet. Boyce has recommended administration of "DECHOLIN" during the pre- and post-operative periods. These Decholin tablets (3 gr.) can be given 2 or 3 times a day for a period of about 72 hours before the operation.

(12) Serum cholesterol content.

(13) Serum protein, albumin and globulin ratio.

(14) Glucose tolerance test.

(15) Vandenberg reaction.

(16) Urea clearance test.

(17) W.R. and Kahn.

While the patient is informed of the nature of surgery indicated, the exact date and time of operation need not be revealed. The following routine is adopted in these cases.

(1) With a view to ensure that the patient is not aware of the day of operation, the nurse should prepare the area of operation by painting with acriflavine in aqua, 1 in 1000, for 10 days. On the day of operation, the solution is changed into acriflavine in spirit which is applied after the patient is anaesthetised.

(2) The Patient is given a rectal drip of 2½% glucose in water after a small enema every day and, on the morning of the operation, avertin is given as a rectal drip about half an hour before the patient is brought to the table. Every morning at about 8-30, the patient gets an injection of 1 c.c. distilled water and, on the day of operation, it is changed to

morphia after consultation with the anaesthetist. This method known as Criles method, though old, is of great service.

Two bottles of blood (700 c.c.) should be ready in the operating room during operation.

Post-operative care of Thyroid cases

As soon as the patient has been transferred to the post-operative ward, the house surgeon must instruct the nurse to watch the patient for the next 24 hours.

(1) The pulse rate should be recorded every 15 minutes for the first 12 hours or until it has become stationary.

(2) Respiration: The patient should be watched for any cyanosis or obstruction of the airway which is not an uncom-

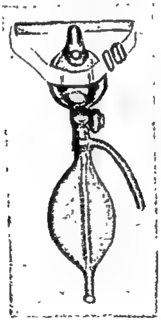


FIG. 24. E L.B. Mask

mon complication in the post-operative period after thyroid surgery. The endotracheal tube should not be removed till the patient comes round completely from anaesthesia and only after consulting the surgeon or anaesthetist should it be

removed. Oxygen should be given through the endotracheal tube or a B.L.B. mask, or the patient may be placed in an oxygen tent.

(3) *Position of the patient:* The patient should lie in a flat position after he is brought back to the post-operative ward. After he regains consciousness, he should be propped up.

(4) Shock: This will be variable depending upon the condition for which he was operated, the size of the gland removed and the difficulty experienced in the removal. Shock is very severe in cases of hyperthyroidism, malignant diseases of the gland and in huge colloid goitres.

Blood transfusion is given during the operation and may be continued in the ward to combat the shock and the blood loss. This is followed by 5% glucose in distilled water, 2 to 3 pints being given intravenously by the drip method.

(5) Drugs:

(a) Lugol's solution, 1/2 drachm, is mixed with 8 oz of tap water and given as a rectal drip for these patients. If the patient can take it by mouth, about 10 min. of Lugol's iodine mixed with orange juice is given. If the patient is vomiting, the Lugol's iodine should be given only as a rectal drip

(b) Morphia is to be repeated every 8 hours, depending upon the patient's restlessness and the respiratory rate. If there is any suggestion of cyanosis or decreased respiratory rate, morphia should be omitted

If the patient has any trachycardia, then digitalis should be given hypodermically or if the patient can swallow it can be given in tablet form. Consultation with a physician may be helpful especially if the patient has cardiac irregularity or auricular fibrillation which is not uncommon in cases of toxic goitre.

Patient should be in a darkened room and kept as quiet as possible for the next 48 hours, no one being allowed to talk to him except the doctor or the nurse.

Penicillin should be given 5 lakhs b.d. for the next three or four days. The wound should be examined 24 hours later when the drainage tube is removed. Alternate clips are removed on the 3rd day and on the 5th day, all the clips are removed. There may be a little collection of serum underneath the wound which may have to be aspirated with a syringe taking the usual aseptic precautions.

There may be a slight rise of temperature for 2 or 3 days. This settles down to normal by about the 4th or 5th day. Patient is allowed to move about on the 5th or 6th day and is discharged on the 9th or 10th day.

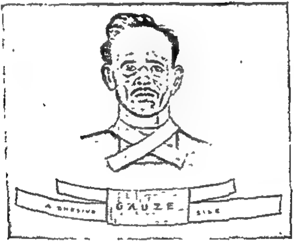


FIG 25 Fixation of Thyroid Dressing by means of adhesive strapping. The adhesive strap should be slit at either end as shown in the diagram In the middle of the strap for about 6" a gauze piece must be placed over the adhesive side This gauze piece prevents the strap from sticking on the back of the neck The ends of the strap are brought in front and passed over the gauze placed over the site of operation so as to keep the dressing in place

(6) Diet: For the first 24 hours, patient may be given ice to suck or sips of plain water or orange juice, if there is no vomiting. After this, patient can be given liquid diet. Solids can be started on the 4th day. Later on, the diet may be increased to the high calorie, high carbohydrate diet as was given during the pre-operative period.

There are a few post-operative complications that are likely to occur:—

(1) **Haemorrhage:** As a result of slipping of the ligature, there may be severe haemorrhage and this may give rise to swelling in the neck with difficulty in breathing and swallowing. If it is from one of the bigger vessels, the patient may have to be taken immediately to the operating room and the bleeding vessel caught and tied. In some cases, it may be due to a generalised oozing and a haematoma may form which may be emptied by removing a clip at one end and introducing a sinus forceps or a probe.

(2) **Thyroid crisis:** This is the most unfortunate and dreaded of complications met in thyroid surgery, and after the advent of Thiouracil and Lugol's iodine therapy, it is becoming less and less frequent It may occur within 6 to 8 hours after operation and the pulse rate of the patient shoots up to about 140 to 160 per minute. The temperature rises to 104 or 105°F and the patient becomes restless and delirious in the end. The treatment consists in giving the patient plenty of oxygen; Lugol's iodine must be given per rectum and if necessary, intravenously; barbiturates and morphia to control the restlessness and blood transfusions or 5% glucose I.V. to check this crisis. To reduce the hyperpyrexia, cold sponging is necessary The house surgeon must be very careful in watching these cases during the post-operative period.

(3) **Post-operative tracheitis** may occur due to a mild trauma to the trachea during thyroidectomy, especially when the thyroid is very firmly adherent to the trachea The patient gets cough, hoarseness of voice and difficulty in breathing. He usualy makes repeated attempts to clear the throat because of the mucus present. The treatment for this would be Tr. Benzoin inhalations, Linctus codeine or Syrupus codeine phosphatus to control the cough. Sometimes, the inflammation of the trachea may extend to the larynx giving rise to oedema. In such cases, immediate tracheotomy may be necessary. Sometimes, the trachea may collapse after the removal of the endotracheal tube which may be due to:—(a) Thinning of

the tracheal rings, or (b) pressure on the trachea by the haematoma. After removal of the endotracheal tube, the patient must be carefully watched and, if there is any sign of respiratory difficulty, a tracheotomy should be done.

If recurrent laryngeal nerve injury has occurred during the operation, the patient should be carefully watched and, when any sign of distress is noted, immediate tracheotomy should be done. In these cases, it is best to reopen the wound and perform the tracheotomy.

(4) **Parathyroid tetany (post-operative tetany):** This is a complication that is likely to occur following a total thyroidectomy. This is most probably due to the parathyroid glands coming off with the thyroid during removal. Symptoms and signs of tetany develop and the patient gets (1) spasm of the hand which takes the form of an accoucheur's hand; (2) tingling and stiffness in the hands and feet; (3) laryngeal spasm.

The accoucheur's hand may be brought about spontaneously or after the application of the cuff of the sphygmomanometer bag and the pressure raised to about 200 m.m. This is the so-called Trousseau's sign which should be considered positive only after the pressure has been there for about 5 minutes. Tapping the facial nerve close to its exit from the stylo-mastoid foramen causes spasm of the facial muscles. This is an additional sign to demonstrate that the patient is having tetany and is known as Chvostek's sign. The treatment for these cases consists in giving the patient 10 c.c. of a 10% solution of calcium gluconate or [illegible] c.c. of 10% calcium chloride solution intravenously. This should be followed by giving calcium by mouth and, in very acute cases, parathyroid extract, 20-25 units daily should be given parenterally. The blood calcium should be ascertained every day.

Albright and his associates have stated that Dihydrotachysterol, 5 mgm. should be given by mouth. When this drug is given, the blood calcium should be repeatedly tested and a maintenance dose of [illegible] mgm. daily for a week, may

have to be given for these patients. Overdosage of Dihydrotachysterol should be avoided as it will produce nausea, vomiting, anorexia, headache, stupor, ataxia and albuminuria. The drug should be stopped as soon as the blood calcium returns to normal. Vitamin D can also be given to control the symptoms.

Parathyroid

Disease of the parathyroid glands may be manifested either as hyperparathyroidism or as hypoparathyroidism.

Hypoparathyroidism may occur either as a result of removal of the parathyroid glands during operations on the thyroid gland or may occur spontaneously due to atrophy of the gland.

Post-operative hypoparathyroidism is an occasional complication after thyroidectomy. The signs, symptoms and treatment of this condition are mentioned in the chapter on the surgery of the thyroid.

Hyperparathyroidism usually occurs as a result of a parathyroid tumour such as an adenoma or it may be due to overaction due to simple hypertrophy.

The clinical picture of a patient suffering from hyperparathyroidism is variable. The symptoms may vary from a mild degree of bone pains to spontaneous fractures. In some cases, osteoclastic tumours appear and in others a generalised fibrocystic disease of the skeleton may be very pronounced. Some patients may have urinary calculi.

The investigations done in these cases are as follows:—

(1) Blood chemistry:

(a) Serum calcium is usually raised and may vary from 12 to 24 mgms. per 100 c.c. the normal being 10 mgm. per 100 c.c.

(b) Serum phosphorous level may fall below 1 mgm., the normal being 2·5 to 3·5 mgms. per 100 c.c.

(c) The serum acid phosphatase level rises due to decalcification of the skeleton.

(2) X-ray of the skeleton to ascertain the presence of a fibrocystic disease or any pathological fractures.

(3) X-ray of the kidney, ureter and bladder to find out if there is any urinary calculi.

(4) A complete urine examination. There is always an increased excretion of calcium in the urine in these cases. Bence Jones protein test should be done to differentiate this disease from multiple myelomas.

(5) Renal function tests.

In cases of parathyroid adenoma, the diagnostic findings are:—

(a) Raised serum calcium;

(b) Lowered inorganic blood phosphorus;

(c) Raised serum acid phosphatase;

(d) Hypercalcinuria;

(e) Impaired renal function and presence of calculi in the genito-urinary tract;

(f) Gastro-intestinal disturbances.

The Treatment of Hyperparathyroidism:

The treatment of hyperparathyroidism is to remove the tumour of the parathyroid gland which may manifest itself as an adenoma or a carcinoma. In some cases, there may be no tumours and there may be only a diffuse hyperplasia. In such cases, 2 or 3 out of the 4 parathyroid bodies should be removed according to their size. Parathyroid glands should never be removed unless they show a definite degree of hyperplasia as they may give rise to a severe degree of tetany after removal of these glands.

Post-operative Treatment:

After operation, the blood calcium and phosphorus return to normal levels. In some cases, the serum calcium

drops to a low level and the patient may get signs of tetany. This is prevented by giving the patient Calcium Gluconate parenterally or Calcium Lactate tablets by mouth. Blood chemistry should be done in the post-operative period and if the serum calcium is low, calcium may have to be given intravenously for a few days till it returns to normal.

After removal of the parathyroid tumour, the patient experiences complete relief from bone pains and the spontaneous fractures heal quickly. Recalcification gradually takes place and the patient must be given calcium by mouth to assist in the process.

Urinary calculi, if small, may break up and disappear In some cases, they may become impacted in the urinary tract and may require removal by operation.

CHAPTER 11

OESOPHAGEAL SURGERY

With the advances made in anaesthesia, chemotherapy and proper fluid and electrolyte balance in the pre-operative and post-operative periods of patients, operations on the oesophagus are performed successfully in increasing numbers.

Foreign bodies in the oesophagus.

Objects like fish bone, meat bone, dentures, coins and safety pins may be swallowed by children. The usual sight of "impaction" is at the cricopharyngeal fold; next in order of frequency is at the level of the thoracic inlet. If the object passes these points of constriction, it is likely to slip through the oesophagus into the stomach. But large bodies like dentures may be impacted near the crossing of the left bronchus. These foreign bodies must be removed as early as possible. If allowed to stay for a long time, they become obscured by the presence of granulations and oedema of the mucous membrane. In such cases, adrenalin should be applied over the congested surface before removal of the foreign body.

After treatment, the patient is allowed liquids for the first two days and thereafter semi-solids like pudding, jelly or congees. Antibiotics are given during the post-operative period

Congenital Atresia of the Oesophagus: This condition can be suspected and identified within the first few hours after the child is born. The usual findings are:—

1. Excessive salivation. The child has a lot of oral secretion rolling in the mouth because of the block in the oesophagus.

2. The child is hungry and eagerly takes to the breast or bottle, but swallowing of the feed is followed by coughing

and cyanosis. If a new born baby has salivation, dysphagia or respiratory distress, the patency of the oesophagus should be investigated.

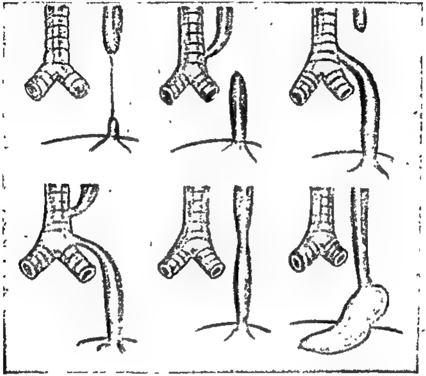


FIG 26 Diagram showing types of Congenital abnormalities of the Oesophagus which can be detected by Roentgenographic studies.

The following investigations should be performed for these cases:—

(1) Roentgenographic studies can be done by passing a small catheter through the mouth or nose into the upper end of the oesophagus and introducing 1 or 2 c c. of lipiodol This will clearly show the abnormality.

Only iodised oil should be used to detect abnormalities of the oesophagus If Barium is used, it may produce severe reaction in the lungs, if it should overflow into the respiratory tract.

(ii) Plain x-ray of the abdomen may show the presence or absence of gas in the stomach or intestines and thereby give information whether any fistulous communication between the lower oesophageal segment and the trachea is present.

In a small percentage of cases, no such fistulae exist between the trachea and the lower oesophageal segment and hence no air will be seen below the diaphragm.

If the abnormality in the oesophagus is not recognised, the general health of the baby rapidly deteriorates. This may be due to:

(i) starvation because of oesophageal obstruction;

(ii) onset of pneumonia due to spilling or saliva overflowing into the respiratory tract;

(iii) pneumonitis caused by the gastric juice passing up the lower oesophageal segment through the fistulous communication with the respiratory tract.

If the child is not attended to as early as possible, it may die of pulmonary complications.

Pre-operative care: The child must be made fit to stand the operation. Dehydration and pneumonitis must be corrected and this takes 24 to 48 hours.

1. Dehydration. Fluids like 10% glucose water are given intravenously to supply the necessary calories. About 10 c.c. per pound of body weight is given every 12 hours.

2. Chemotherapy and antibiotics are given to combat respiratory infection. Penicillin 2½ to 3 lakhs and Streptomycin 30 mgms per pound of body weight should be given every 24 hours.

3. Suction. Number 6 or 7 size catheter is passed down through the nose into the oesophagus and continuous suction employed to remove all the secretions in the oesophageal pouch.

4. For cases of fistulae between the lower oesophageal segment and the respiratory tract, the child should be in the semi-sitting position to prevent the gastric juice running into the tracheo-bronchial tree.

If the child has a communication between the upper oesophageal segment and the trachea, the infant must be placed in the prone position and the foot of the bed elevated to prevent secretions entering the tracheo-bronchial tree. At the same time, a catheter is passed into the pharynx and suction employed.

Post-operative care. After surgery, the infant is given;

1. Penicillin and Streptomycin parenterally to control pulmonary infection.

2. Saliva that accumulates in the mouth and pharynx is removed by catheter suction.

3. The child is given a high concentration of oxygen.

4. A small blood transfusion on the 2nd or 3rd day, if necessary.

5. Fluids like 5% glucose in water and ½ strength normal saline are given to supply the necessary nutrition.

6. Vitamins in the forms of ascorbic acid or a combination of vitamins is given parenterally.

7. Oral feeding is started on the 10th post-operative day. The child is given a teaspoon of water or glucose water and is watched to find out if there is any trouble in swallowing If the child is able to swallow, it is then put on a milk formula according to the pediatrician's advice.

8. If the child's general health is very poor, a gastrostomy may be done and feeding started on the 2nd or 3rd day, giving about ½ oz. of glucose water every 2 hours. If the child is able to take it satisfactorily, then the child is given an intragastric drip feed.

In about 3 weeks' time, the child will be able to take its feed easily by mouth and the gastrostomy tube may be removed after 1½ or 2 months.

Oesophagectomy

Many factors have helped to lessen the hazards of this very difficult form of surgery, one of the most important being the proper preparation of the patient.

Partial or total oesophagectomy is done for cases of cancer of the oesophagus. The pre-operative studies before subjecting the patient to radical surgery are:—

1. Routine blood examination,
2. Urine examination,
3. Blood for Wassermann or Kahn,
4. a. Bleeding time,
   b. Coagulation time,
   c. Prothrombin time,
5. Serum proteins and Albumin-Globulin ratio,
6. Blood chemistry, i.e. Blood chlorides, Co_2 combining power, Blood Na, and K.
7. X-ray of chest and long bones for evidence of secondaries,
8. Ba. swallow and roentgenographic examination,
9. Oesophagoscopy and biopsy.
10. Renal function tests as these patients are usually past the age of 50 years.
11. Cardio-vascular status and E. C. G.
12. Liver function tests.
13. Bronchoscopic examination, particularly if the oesophageal growth is at the level of the left bronchus,
14. Blood grouping.

Preparation of the patient: The patient's general health must be rapidly improved by giving him plenty of vitamins and amino-acids. The majority of these patients are not able to take any solids and their nutritional state is well below normal. If the patient is able to take fluids by mouth, a high protein and carbohydrate diet must be given Dehydration

must be corrected by giving him fluids parenterally in the form of 5% glucose saline. Vitamin C, 500 mgms twice ■ day and Vitamin K, 20 mgms daily, are given intramuscularly.

Gastrostomy or jejunostomy should not be carried out if patient is able to swallow fluids. Patient must have ■ jug of milk at his bedside and he must be encouraged to drink as often as possible About two pints of milk to which 2 eggs and 2 ozs. of sugar have been added, should be taken daily.

If the serum proteins are low, patient must be given plasma or blood transfusion to correct the deficiency rapidly. Protein hydrolysate can be given by mouth and, if necessary, parenterally.

Oral hygiene: Infection in the oral cavity is controlled by removing all carious and loose teeth. Gargling of the mouth should be done using Condys (1 in 500 Sol.) or saline or Dettol after each feed.

Antibiotics are given parenterally. for 3 or 4 days before operation—Penicillin 1 million units daily and Streptomycin 1 gm. daily.

Most of these patients are anaemic and their Haemoglobin percentage is raised by giving ■ or 3 blood transfusions before operation

Breathing exercises should be taught in the pre-operative period so that the patient can prevent lung complications in the post-operative period. Smoking is forbidden two days before the operation

This pre-operative preparation takes about 10-15 days before the operation can be done

Instructions before operation:

1. The skin of abdomen and chest on both sides are shaved and washed with Phisoderm or Cetavalon solution.

2. A soap and water enema is given on the morning of operation.

3. A Ryle's tube or Levine tube is passed upto the level of the growth in the oesophagus and all the mucus and salivary secretions present sucked out before operation.

FIG. 27 Barium swallow showing a growth at the Lower end of oesophagus

4 Three pints of blood should be available during the operation.

5. Pre-medication with morphia and Scopolamine after consulting the anaesthetist.

Post-operative care:

1. The anaesthetist aspirates any mucus which may be present in the trachea or main bronchus of the patient before he leaves the operating room.

2. The patient is given oxygen through (a) an oxygen tent or, if not available, (b) through a nasal catheter.

3. The drainage tube from the pleural cavity is connected to a closed water seal or to a suction apparatus which produces a negative pressure of 8-10 cms. of water. When the patient is transferred from the operating room to the post-operative ward, the water seal which is connected to the drainage tube must be held at a lower level about 2 feet below the bed and should on no condition be raised as the fluid might be sucked into the pleural cavity. If the tube is not connected to a water seal, then it is clamped and after the patient has been removed to the post-operative ward, it is connected to a water seal or suction apparatus.

The intercoastal drain should not be kinked or blocked and the water seal drainage bottle is inspected frequently to make sure that the column of fluid is moving with respiration and that a satisfactory negative pressure is maintained.

4. Radiological examination of the lung is made daily for 4 or 5 days, to find out whether the lung has expanded and to determine the amount of fluid in the pleural cavity.

5. The drainage tube is usually removed on the 3rd or 4th day as soon as it becomes plain that haemorrhage has ceased. Care is taken in withdrawing the tube to see that air does not enter the pleural cavity and an effective way of ensuring this is to wrap around the tube with a sterile gauze and to hold it firmly against the chest wall during the withdrawal of the tube. The gauze is then strapped to the skin. If there is any further accumulation of fluid after removal of the tube, it can be removed by aspiration.

6. Blood pressure, pulse and temperature should be recorded every hour till the patient's condition is satisfactory.

7. Blood transfusion may be continued after the operation depending on the patient's condition.

8. Morphia is given to relieve pain.

9. Deep breathing exercises and gentle coughing are encouraged to prevent post-operative atelectasis or lung complications.

10. The foot of the bed is elevated for about 8 hours and if the blood pressure and pulse rate are steady, the patient is placed flat in bed.

11. Antibiotics like Penicillin and Streptomycin are given daily for the next 7 to 8 days.

12. During the post-operative period, parenteral administration of fluids like 5% glucose, or 5% glucose in normal saline and Vitamins are given to supply the necessary nourishment.

Fluid balance must be maintained by intravenous method for the first few days. If fluids are given orally before the 7th or 8th day, there is a risk of leakage occurring. If the patient has had an oesophago-gastric anastomosis, then there is risk of distension, leakage or paralytic ileus of the stomach or small intestines developing when fluids are given early. Hence some surgeons pass a Ryle's tube beyond the site of anastomosis for suction. Others leave the Ryle's tube above the anastomosis to suck out the secretions that accumulate at the suture line, as it is felt that the presence of the Ryle's tube over the operated area may be an irritant and a source of pressure.

In cases of oesophago-gastric anastomosis, the Ryle's tube that has been passed into the stomach is used for continuous suction for 6—7 days. After the 7th day, the patient is given small amounts of water about ½ oz. at a time by mouth. When the patient is able to take feeds orally, parenteral therapy is discontinued.

For the next 5 days, patient is given liquids like citrated milk, orange juice, barley water, etc. After this period the patient can be given soft food like pudding, custard, jelly or congees. The soft foods are given once or twice a day and in between liquid feeds are given

13. Enema is given on the 3rd day of operation.

14 Some patients are allowed to move about in a wheel chair on the 3rd or 4th day and others, after removal of the stitches depending upon their condition.

15. Skin sutures are removed on the 12th day. Just before the patient is discharged, X-ray pictures are taken after a Barium swallow.

Achalasia Cardia

1. The usual pre-operative studies mentioned above should be done and the patient prepared for operation by correcting the dehydration, anaemia, and hypoproteinaemia.

2. Ryle's tube must be passed and the oesophagus must be gently washed with saline and the contents aspirated. In some cases, syphoning or lavage with a stomach tube can be done to remove all the stagnant food.

Fig. 28. Barium swallow showing Stasis of Barium in the oesophagus due to Achalasia cardia

3. On the morning of the operation, the Ryle's tube is passed and left in position.

After the operation, the patient is given parenteral fluid therapy for 5 days.

Continuous suction of the stomach contents through a Ryle's tube is maintained during this period.

The patient can be given small sips of water on the 5th or 6th day and gradually, the feeds may be increased every day.

Violent retching, vomiting and coughing should be avoided as it may result in a rupture of the mucosa, if a Heller's operation has been done. The rest of the post-operative care is the same as for a case of gastrectomy.

CHAPTER II

GASTRIC SURGERY

In the management of these cases, the following investigations should be carried out: —

1. Routine blood count and urine analysis.
2. Routine motion examination.
3. Occult blood test in stools.

FIG. 29 Skiagram shows a gastric ulcer

4. F. T. M. (Fractional Test Meal).
5. Barium meal series with particular reference to stomach and duodenum.
6. Roentgenogram of the chest.

7. Serum proteins with albumin and globulin ratio.
8. Prothrombin time.
9. Blood chemistry which includes:
   (a) Blood chlorides,
   (b) CO_2 combining power of blood.
   (c) Blood urea, if the patient is past the age of 40 years.

FIG. 30. Barium meal Skiagram showing cancer of the Pylonic segment of the stomach

10. Blood sugar, if the patient is a diabetic.
11. W. R. and Kahn.
12. Liver function tests, if cancer of the stomach or intestinal tract is suspected.
13. E. C. G.
14. Sigmoidoscopic examination, if the patient gives history of bleeding or melena or any dysfunction.

Pre-operative preparation:

This consists in treating the altered blood chemistry hypoproteinaemia, vitamin deficiency, anaemia and dehydra-

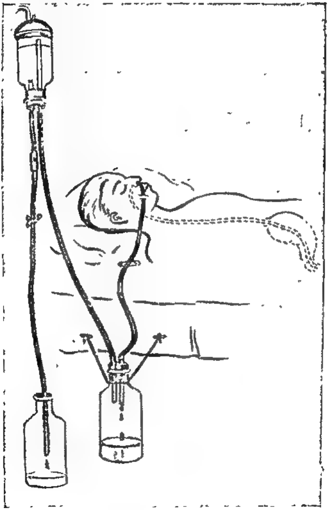


Fig. 31. Wangenstein's suction connected to a Ryle's Tube to decompress the stomach or Intestines.

tion. If the patient comes in with a partial or a complete duodenal obstruction, a Ryle's tube is passed into the stomach

and the stomach decompressed completely. All food is withheld by mouth for about 4 or 5 days and the stomach is washed with a little saline through the Ryle's tube. The Ryle's tube is connected to a suction syphonage of the Wangenstein type and the stomach is thus given complete rest before operation. The tone of the stomach gradually returns to normal. The infection in the stomach is also controlled and the oedema of the stomach wall, the result of hypoproteinaemia, relieved by the above treatment.

The *dehydration* is corrected by giving intravenous fluids; a minimum amount of 2,000-3,000 c.c. of fluids is necessary for these patients. About 50 to 60 c.c. per Kgm. of body weight per day is a rough estimate of the amount of fluid that is necessary for these patients. When giving these fluids, one must check up the cardiac status and the total blood protein content. An intake and output chart should be maintained to see how the patient is progressing with the daily administration of fluids. His blood chemistry should be determined frequently to check the blood chlorides. If the blood chlorides are low, the patient is given saline, the amount required being calculated before administration. For every 100 mgm. fall in the level of blood chlorides, roughly 0·5 gm of sodium chloride per Kgm. of body weight should be given. If the patient is having severe alkalosis as in cases of pyloric obstruction, saline should be given.

Hypoproteinaemia is the next important complication which must be corrected before operation. If it is not done, the oedema produced by hypoproteinaemia may be sufficient to produce non-function of a technically perfect gastro-enterostomy If the hypoproteinaemia is not corrected, wound disruption or burst abdomen is also another likely complication after gastric surgery. The most rapid method of correcting this condition is to give plasma. About 300 to 500 c.c. will elevate the serum protein level of these patients quickly.

Intravenous administration of amino-acids has of late come into prominence to correct the hypoproteinaemia. Before giving these amino-acids intravenously, one must find

out whether the patient is allergic to this form of protein therapy.

If the patient is having only a partial pyloric obstruction, an intra-gastric milk drip through an indwelling Ryle's tube is given.

A fairly high caloric diet of fluids should be given to correct the malnutrition before any operative procedure is undertaken. Vitamin deficiency is present in these cases especially when they have a partial or a complete obstruction. Intra-muscular injections of Vitamin B-complex are absolutely essential as a deficiency of this vitamin leads to oedema and atony of the gastro-intestinal tract. Intestinal atony responds very quickly to Vitamin B-complex administration. These patients therefore should receive thiamine hydrochloride, liver extract and B-complex. A patient, who is being prepared for a gastric or duodenal surgery, should have Vitamin C. deficiency corrected, as this deficiency is likely to retard the healing of the wound. These patients should, therefore, receive 200 mgms of Vitamin C, 50 mgms. of Nicotinic acid, 20 mgms. of Thiamine every day. Vitamin K administration also may be necessary to correct the hypoprothrombinaemia which may occur in cases of gastric cancer.

The anaemia should be corrected by blood transfusion every third or fourth day, till the Hb. level is about 70 to 75 per cent.

Treatment: The patient with an acute duodenal ulcer is given:

(1) Alkaline preparations such as Aluminium Hydroxide gel. by mouth.

(2) Calcium gluconate with 1/100 gr. atropine intravenously daily.

(3) Protein Hydrolysate preparations can be given by mouth to combate the hypoproteinaemia. The night before operation, the stomach is washed and Ryle's tube is left in place. All oral feedings are stopped. Enema is given in the

morning and the abdomen prepared for operation. 5%. glucose saline and blood 500 c.c. should be available at the time of operation.

Post-operative management:

1. If the patient is operated under spinal anaesthesia, the foot of the bed is raised for about 6 to 8 hours.

2. The blood transfusion started during the operation is to be followed by saline (5% glucose saline) or blood depending upon the extent of the shock and the general condition. As soon as the shock is combated, an intravenous drip of 5% glucose in normal saline or distilled water should be given. Blood pressure and pulse rate should be recorded every half an hour for the first 6 hours and thereafter every hour for 6 hours or till they have returned to normal.

3. Morphia should be given ¼ gr. with 1/150 gr. of atropine to relieve the pain at about 9 p.m. in the night.

4. The indwelling Ryle's tube should be connected to a suction syphonage and its proper working should be checked by a nurse every hour for the first three days.

5. Fluid administration is given intravenously every day and an intake and output chart should be maintained. Roughly about 1 pint of normal saline and about 2 to [illegible] pints of glucose in distilled water are necessary for these patients.

6. Nothing is given by mouth for about 48 hours in a case of gastro-enterostomy and for about 4 or 5 days in a case of sub-total gastrectomy. This method prevents any dilatation of the stomach and also any tension at the site of anastomosis. In cases of gastrectomy, it also prevents a duodenal stump blow-out.

7. Patients after gastrectomy may require a small blood transfusion on the 4th day.

8. Chemotherapy or antibiotics should be given for these patients. Penicillin, 5 lakhs b.d., and Dihydrostreptomycin, 1 gm. daily, are necessary.

out whether the patient is allergic to this form of protein therapy.

If the patient is having only a partial pyloric obstruction, an intra-gastric milk drip through an indwelling Ryle's tube is given.

A fairly high caloric diet of fluids should be given to correct the malnutrition before any operative procedure is undertaken. Vitamin deficiency is present in these cases especially when they have a partial or a complete obstruction. Intra-muscular injections of Vitamin B-complex are absolutely essential as a deficiency of this vitamin leads to oedema and atony of the gastro-intestinal tract. Intestinal atony responds very quickly to Vitamin B-complex administration. These patients therefore should receive thiamine hydrochloride, liver extract and B-complex. A patient, who is being prepared for a gastric or duodenal surgery, should have Vitamin C. deficiency corrected, as this deficiency is likely to retard the healing of the wound. These patients should, therefore, receive 200 mgms. of Vitamin C, 50 mgms. of Nicotinic acid, 20 mgms. of Thiamine every day. Vitamin K, administration also may be necessary to correct the hypoprothrombinaemia which may occur in cases of gastric cancer.

The anaemia should be corrected by blood transfusion every third or fourth day, till the Hb level is about 70 to 75 per cent.

Treatment: The patient with an acute duodenal ulcer is given:

(1) Alkaline preparations such as Aluminium Hydroxide gel. by mouth.

(2) Calcium gluconate with 1/100 gr. atropine intravenously daily.

(3) Protein Hydrolysate preparations can be given by mouth to combate the hypoproteinaemia. The night before operation, the stomach is washed and Ryle's tube is left in place. All oral feedings are stopped. Enema is given in the

9th to 11th day. Boiled bread, custard and pudding.

12th day. Rice and curds.

Gastric Haemorrhage

Cases with duodenal or gastric ulcer may have repeated small haemorrhages or severe massive haemorrhage. In these patients, the pre-operative investigations that should be done are:—

1. Blood count, R.B.C. and Haemoglobin percentage.
2. Haematocrit reading.
3. Urine analysis.
4. Blood grouping.
5. Motion examination for occult blood.
6. Blood proteins.
7. Prothrombin time.
8. Barium meal series. When the bleeding has stopped and 2 or 3 weeks have elapsed after haemorrhage, a barium meal series may be done.
9. Liver function tests.
10. Esophagogram is done to find out if there are oesophageal varices.

During the haematemesis, the patient should have the following treatment:—

1. Nothing by mouth for 48 hours.
2. Foot of the bed raised; pulse and blood pressure recorded every 15 minutes during the attack of haemorrhage.
3. Blood transfusion must be started, if the bleeding is severe and the haemoglobin percentage and the blood pressure have fallen. The transfusion should be given by the drip method.
4. If the bleeding is severe and all methods of rallying the patient by large transfusions have not succeeded, surgical intervention is immediately

9. Vitamins should be given parenterally in the form of Vitamins C and B-complex daily and, in some of the cases of gastrectomy, amino-acids can be given intravenously.

10. Routine examination of the patient for hypopotassimia during the post-operative period should be done.

11. The position of the patient should be changed every [illegible] hours and deep breathing encouraged.

12. Catheterisation of the bladder is done twice a day, if the patient is not able to micturate of his own accord.

13. Glycerine Enema should be given on the 3rd day and repeated on the 5th day if necessary.

14. Sutures are to be removed on the 10th day.

Diet: In cases of gastro-jejunostomies, fluid diet is started on the 3rd day after operation and in cases of gastrectomy, 5th day after operation. The diet chart is as follows:—

Post operative treatment after gastrectomy -

1*st to 4th day.* (1) Nothing by mouth. (2) Continuous suction and hourly aspiration. (3) 1 V drip. 1 pint of 5% glucose in N. saline and [illegible] pts. of 5% glucose in Dist water daily.

5*th day.* (1) Sips of glucose water. (2) Continuous suction and 4th hrly. aspiration. (3) 1 V. drip 1 pint of 5% glucose in saline, 1 pint of 5% glucose in Dist water.

6*th to 9th day.* (1) Citrated milk. (2) Albumen water. (3) Glucose water: ½ to 1 oz. at a time every 2 hrs. slowly increasing every day and on the 9th day 3 to 4 ozs. every 3 hrs or 4 hrs.

10*th to 11th day* Boiled bread or pudding or custard.

13*th day.* Rice and curds.

Diet for Gastro-jejunostomy Case

1*st to the 3rd day.* As in a case of gastrectomy.

4th day. Sips of glucose water.

5*th to 8th day.* Feeds like milk, albumen water and glucose water are given.

Since the patient has severe nausea and vomiting, food by mouth is withheld for one or two days.

As soon as the patient has rallied round, liquid diet in the form of milk should be given every hour. This is supplemented with antacid powders. 3 to [illegible] grams of NaCl may be added to each quart of milk to prevent salt depletion. Solid diet can be given after one or two weeks when the patient shows signs of improvement or when there is no occult blood in the stools for 3 or 4 days.

(Meulengracht employs a diet in all these bleeding peptic ulcers as early as possible. The food must be of high caloric value and non-irritant. His diet is as follows:—

6 A.M. Tea, white bread and butter.

9 A.M. Oat meal with milk, white bread and butter.

1 P.M. Boiled chops, omelette, vegetables or meat or fish boiled, mashed potatoes, vegetable purees or soups, rice and tapioca puddings.

4 P.M. Tea.

8 P.M. White bread and butter, cheese and tea.

Following the acute episode, the emergency measures mentioned above should be adopted and the diet gradually increased from liquids on to solid bland foods).

Gastrostomy

The pre-operative treatment for a case selected for gastrostomy is as follows:—

1. Fluids must be given parenterally as most of the patients are not able to take solid diet.
2. Blood transfusion to improve the general condition.
3. Vitamins are also given to these patients which include Vitamins B, C. and K.

The usual investigations are done:—

1. A complete haematological and urine examination should be done.

indicated and should not be postponed till the patient is in extremis.

If the patient's blood pressure could not be maintained or if the haematocrit reading of 30 cannot be maintained with blood transfusion, surgery is absolutely essential if the patient is to be saved.

The pre-operative treatment in these cases consists of the following:-

1. Morphia $\frac{1}{6}$ gr. with atropine $\frac{1}{150}$ gr. repeated every 6 or 8 hours.
2. Vitamin K, 10 mgms. intravenously, and Calcium Gluconate 10%—10 c.c intravenously. Haemostatics like Coagulen Ciba or Clauden is given parenterally.
3. *Penicillin and Streptomycin or Aureomycin* are given before operation.
4. A Ryle's tube is passed down into the stomach to aspirate the gastric or duodenal contents to prevent the gastric juice from digesting the blood clot at the site of bleeding

During operation, the patient is given blood transfusion to maintain the blood pressure until the bleeding is surgically controlled.

After operation, the post-operative treatment is similar to that employed for cases of gastric surgery.

If conservative measures have been adopted for arrest of bleeding, the following treatment is started for the patient.

(a) *Dehydration and salt depletion* corrected by giving physiological saline, 1 to 1½ litres daily, by the intravenous route.
(b) Oral liquid feedings as soon as tolerated. If the patient has nausea, vomiting or thirst, they may be controlled by giving fluids parenterally.

This policy of initial starvation during an attack of haematemesis is the subject of considerable controversy.

patient through the gastrostomy tube with glucose water or milk, only 1 oz. being given every hour; on the 2nd day, 2 ozs. every hour; on the 3rd day, 3 ozs. every hour; on the 4th day, the same; on the 5th day, 5 ozs. every two hours; and on the 8th day, 8 ozs. every three hours.

Immediately after the gastrostomy tube has been fixed to the stomach and the patency tested, a feed consisting of 4 ozs of milk mixed with two eggs, two ounces of liver extract and some sugar (50 gms.) is given or plain milk alone about 4 ozs. may be given instead. Vitamin preparations like Vitamins B and C are also added to the feeds.

After 15 or 20 days, if there is any leak on the sides of the gastrostomy tube, the tube, may be removed and a fresh one inserted.

These patients are usually bad risks and therefore should be prepared well before operating on them as the mortality and morbidity is very high.

Jejunostomy

Here an opening is made in the upper portion of the jejunum and is used for feeding purposes.

1 Jejunostomy is done in cases of cancer of stomach where the lesion is so extensive that neither a gastroduodenectomy nor a gastrectomy can be done.

2. It is also done as a temporary measure after total gastrectomy for feeding purposes.

3. In cases of duodenal fistulæ, jejunostomy can be done to feed the patient.

A jejunostomy is done after the usual preparation as for any major abdominal operation under local anaesthesia.

Post-operative care would consist in:—

1. The nourishment of the patient is through intravenous route for the 1st 24 to 48 hours.

2. Blood urea.
3. Total proteins.
4. Blood grouping.

The pre-operative treatment done just before the operation is as follows:—

1. Preparing the abdomen;
2. An enema on the morning of the operation.

A couple of pints of 5% glucose in water and 300 to 400 c.c. of blood should be ready in the operating room.

FIG 32 A gastrostomy done for Benign stricture of oesophagus The patient is seen feeding himself after connecting a funnel to the gastrostomy tube.

Post-operative treatment consists in giving Omnopon to relieve pain. Fluids are given intravenously till the patient is able to take enough nourishment through the gastrostomy tube. On the first day of operation, the nurse feeds the

half to one teaspoonful, is given every hour starting about 12 hours after the operation. On the second day, the child is given breast milk or a milk formula under the supervision of a pediatrician. The child should be given Vitamins parentarally and on the 7th or 8th day, it should be administered by mouth. Post-operative lung complications should be watched and the child kept under an umbrella of antibiotics. Once the bowel movements have started and there is no abdominal distension, the child recovers very quickly and gains in weight. In the post-operative period ice bag should be applied to the head and limbs to prevent the baby from getting high fever and convulsions. In these cases, complete cooperation between the pediatrician and the surgeon is necessary for a successful result.

Total Gastrectomy

Patients who are to have a total gastrectomy should receive adequate preparation beforehand. All the investigations mentioned for cases of peptic or duodenal ulcer should be carried out.

The following pre-operative treatment should be done for these cases:—

1. Hypoproteinaemia is corrected by giving proteins or amino-acids by the parenteral route.
2. Secondary anaemia should be corrected by blood transfusion.
3. Dehydration is corrected by giving glucose or glucose saline solutions intravenously.
4. The stomach is washed with saline every morning for two days prior to the operation.
5. In cases where cancer of the stomach is suspected, Hydrochloric Acid in strengths of ½% should be given by mouth morning and evening in doses of ½ to 1 drachm.
6. Soap and water enema is given the evening before operation.

2. Small amounts of glucose water or saline in doses of ½ to 1 oz. are given at hourly intervals through the jejunostomy tube. After 2 to 3 days, patient is given, milk, eggs and sugar made up in the form of an egg filip through the tube.

3. Vitamins and Protein Hydrolysate preparations are also given through the tube.

Around the tube, skin irritation is likely to occur due to the action of the intestinal juices. This condition may be relieved by painting the skin with white of an egg or by covering it with a gauze soaked in milk.

Congenital Pyloric Stenosis

The usual investigations are done and, with the co-operation of the pediatrician, the dehydration, the hypoproteinaemia and the anaemia are corrected as quickly as possible. Blood transfusion is given to these infants and the amount given intravenously should be about $\frac{1}{40}$th of the body weight or 10 c.c. per pound body-weight. This should be given by the open method. The dehydration in the infant is corrected by giving 8 to 12 ounces of 5% glucose saline solution subcutaneously into the axilla or thighs during the 24 hours prior to operation If the blood chloride is below 600 mgms per 100 c.c. operation is delayed. The fluid intake of the infant should be about 2½ ounces per pound body weight daily. Atropine is contra-indicated in these infants as it appears to increase the risk of post-operative hyperpyrexia. Chloral hydras 2 to 3 grains may be given. A Ryle's tube is passed and the stomach is washed with normal saline.

Post-operative management:

This consists in having the indwelling Ryle's tube for 24 to 48 hours but no suction is employed unless distension is present. The fluid balance is carefully checked and a very close watch on the intake and output should be maintained. A small blood transfusion during the operation is a valuable adjunct in the treatment of these cases. Glucose in water,

9. If on the 7th or 8th day after operation there is nothing aspirated from the jejunum, the Ryle's tube is removed and the patient is given water ½ oz. every 2 hours. From the 8th day onwards, the feeding by mouth is increased and on the 12th day after operation, the patient takes milk, ovaltine, soup etc. On the 14th or 15th day, the patient is given custard, jelly or pudding. On the 16th day after operation, the patient is given bread and butter with eggs. On the 21st day, the patient gets a normal diet but small in amount.

10. After a total gastrectomy, the patient must have six small meals a day and the caloric value should be about 2000 to 3000 calories.

Post-operative complications after Gastrectomy:—

1. *Haemorrhage.* This is likely to occur as soon as the patient recovers from shock with the result that only blood may be aspirated through the Ryle's tube. The patient must be carefully watched for evidence of any internal bleeding which may be at the site of anastomosis or from slipping of ligatures. Haemostatics should be given to control the bleeding and blood transfusion to supply the lost blood If there is a rising pulse rate due to severe bleeding, it may be necessary to open the abdomen again and inspect the stoma for ligating the bleeding points.

2. *Leakage from the duodenal stump.* This can be avoided by closing the duodenal stump carefully and maintaining a continuous suction through the Ryle's tube that has been passed into the proximal limb of the jejunum.

3. *Post-operative obstruction.* This is due to slight oedema of the stoma which usually disappears in about a couple of days Sometimes, the obstruction may be due to errors in operative technique.

4. *Ulcers in the jejunum* are likely to occur, especially if the patient is having a high acidity. The treatment in such cases is vagotomy.

7. Before the patient is taken to the theatre, a Ryle's tube is passed and the stomach is emptied by suction.

8. Breathing exercises are taught to these patients before operation so as to avoid post-operative lung complications like atelectasis or infection.

Post-operative care:

1. After operation, the patient is given 1 pint of glucose saline and 2 or 3 pints of glucose in water by the drip method to give the necessary nourishment.

2. Foot of the bed is slightly elevated for about 6 to 8 hours in cases where spinal anaesthesia has been used.

3. The Ryle's tube that was left in situ for draining the jejunum after Oesophago-jejunostomy is connected to a suction apparatus. This continuous suction is employed for 7 to 8 days and nothing is given by mouth for these patients during this period.

4. The patient's nourishment is maintained for the first 7 days by giving fluids like 5% glucose in water or saline, protein hydrolysate and vitamins parenterally.

5. During and after the operation, the patient may require transfusion of about 350 to 750 c.c. of blood depending upon the shock and blood loss.

6. The patient is encouraged to exercise his leg muscles during the post-operative period so as to prevent any thrombosis of the veins.

7. To prevent lung complications, breathing exercises are encouraged.

8. In those cases where a jejunostomy also is done with total gastrectomy, feeds are started about 10 hours after the operation. Every day, the jejunostomy feeding should be increased. The jejunal feeding should contain milk, sugar, orange juice, eggs and vitamins.

duodenal ulcer. After this operation, the acid secretion in the stomach is reduced and the ulcers heal.

Certain investigations are carried out before the operation to find out the degree of acidity.

1. F.T.M. This shows only the hormonal response to food.

2. Histamine test. This is of value to differentiate cases of true and apparent achlorhydria. The chief value of this test meal is to warn the surgeon of the risk of stomal ulceration when high readings of HCl are obtained.

3. Insulin test. Insulin injection evokes an acid secretion *in the stomach by the direct effect of Hypoglycaemia* on the central nervous system. 6 units of Insulin is injected intravenously. The blood sugar is estimated before and one *hour after injection. If the blood sugar falls to 50 mgms.* per 100 c.c. there is a pronounced elevation both in amount and in the acidity of the fasting juice within ½ to 1 hour. The stomach contents are aspirated at intervals of 10 minutes and this test is of great value in deciding whether Vagotomy will be helpful or not. No Insulin effect is obtained after complete vagotomy.

The operation can be done either through the transthoracic route or abdominal route. The preparation for these cases is similar to a case of gastrectomy or a gastro-jejunostomy.

A Ryle's tube is passed and all the stomach contents are aspirated and the tube left in situ.

Post-operative care:

Vagotomy has certain side effects which are not serious. These patients have a feeling of distension and a mild degree of ileus occurs for 48 to 72 hours after operation. Post-operatively, continuous gastric *aspiration is carried out* for a period of 4 days. The fluid and electrolyte balance must be carefully maintained and an intake and output chart

5. *Lung complications* are avoided by asking the patient to do deep breathing exercises.

6. All cases of *total gastrectomy* have a penrose drain from the Morrison's pouch and another from the lesser sac. These tubes are removed after the 4th or 5th day, depending upon the amount of drainage.

7. *Anaemia* is a late complication after total gastrectomy and is due to loss of intrinsic factor. This can be corrected by iron, vitamin B_{12} or blood transfusion.

8. *Dumping syndrome*: A small percentage of patients suffer due to a quick passage of food into the small intestines. They have a feeling of fullness of upper abdomen after food, sweating, nausea, palpitation, weakness, giddiness, faintness and even syncope. These symptoms which the patients have are easily overcome by:—

(a) taking small frequent feeds;

(b) taking dried foods such as cereals, toast, crackers and biscuits.

(Liquid foods should be avoided)

(c) The patient must be in bed for about 20 to 30 minutes after each feed and the amount of fluid taken during this period should also be restricted.

In cases where a Gastrectomy is done through an abdomino-thoracic route, the same post-operative care should be adopted and, in addition, the patient must have an X-Ray of the chest to find out whether there is any fluid in the pleural cavity and whether the lung has expanded fully. Once the lung has expanded fully and there is no fluid in the pleural cavity, the drainage tube which was connected to a water seal at the time of operation can be removed. The tube is usually removed on the 2nd or 3rd day.

Vagotomy

This operation was introduced by Dragstedt in 1945 as a method of treatment for patients suffering from uncomplicated

CHAPTER 13

COLON SURGERY

Pre- and Post-Operative treatment for Colon Surgery:

Careful preparation of the intestinal tract is of vital importance when an operation on the colon or rectum is to be done. The success or failure of the operation will depend upon the pre-operative and post-operative treatment. A good preparation of the patient for colonic surgery means a safe post-operative course for the patient.

Pre-operative investigations are :—

1. Cell count and Hb %
2. Complete urine examination,
3. Routine motion examination,
4. Prothrombin time,
5. Serum proteins,
6. Plain x-ray abdomen with patient in erect and recumbent positions,
7. Sigmoidoscopy and, if any growth is present in the rectum, a biopsy of the growth is done for pathological examination,
8. Roentgenogram after a Barium enema.

Special investigations for colonic surgery are : —

(a) Urea clearance test,

(b) Brom-sulphalein dye test for liver function,

(c) Vandenberg reaction,

(d) W. R. and Kahn,

(e) X-ray chest for evidence of tumour metastasis,

(f) E. C. G.

kept. When the stomach has regained its tone, patients can be given milk and other fluids. The patient's diet can be gradually increased only after finding out whether there is stasis in the stomach.

To overcome the gastric ileus which occurs after vagotomy, a gastro-jejunostomy is done as a routine in these patients.

In cases where the patient cannot stand a sub-total gastrectomy for Duodenal ulcer, Vagotomy with gastro-jejunostomy is a good substitute.

9. Chemotherapy or antibiotics started 24 hours prior to operation by the parenteral route.

10. If a right-sided Hemicolectomy is to be done, a Ryle's tube or preferably a Miller-Abbott tube is passed well down into the small bowel before the patient comes for surgery. A Miller-Abbott tube will be better and will be very effective in preventing post-operative distension of the small bowel.

11. Patient should have a light diet at about 7 P.M. the previous evening.

12. Abdomen and perineum prepared for operation.

13. Pre-anaesthetic medication given after consultation with the anaesthetist.

14. Blood 500 c.c. to 750 c.c. should be ready at the time of operation for transfusion.

Post-operative treatment:

1. Wangenstein's suction is applied through the Ryle's tube or Levine tube for about five days till the peristalsis becomes normal and the patient passes flatus.

2. Rectal tube should be kept in place and frequently removed to check whether there is any blocking.

3 Fluids like 5% glucose saline and 5% glucose in distilled water should be given intravenously daily.

Blood chemistry should be done on alternate days when the patient is on intravenous fluids so that the nature of fluid to be administered can be varied according to his blood chemistry.

4. Intake and output chart should be maintained and fluid balance carefully noted.

5. Vitamins and amino-acids to be given.

6. Chemotherapy or antibiotics for 7 to 10 days after operation.

7. No fluids to be given by mouth except a little to moisten the tongue from time to time, till the surgeon is satisfied that intestinal peristalsis has started.

Pre-operative treatment:

1. Plenty of Vitamins with low residue diet.

2. Protein hydrolysate to be given daily by mouth—to restore serum protein to as near normal as possible.

3. Blood transfusion to correct anaemia.

4. Non-protein Nitrogen and chloride levels of the blood should be checked and the electrolyte imbalance restored to normal.

5. Cardio-vascular or any renal disease should be carefully evaluated and treated, if necessary.

6. If patient has had any thrombosis of the deep veins, prophylactic femoral vein ligation or post-operative anti-coagulent therapy may have to be given.

7. Bacterial flora of the colon should be reduced to minimum by any one of the following drugs.

(a) Sulphasuccidine 0·5 gm. per Kgm. bodyweight for every 24 hours, the drug being given in divided doses every 4 hours After the 1st day, the dosage is reduced to half and given for 6 days.

(b) Pthalyl Sulphathiozol or Sulphapthalidine in doses of 2 gms four times a day can also be given for 3 to 5 days before operation.

(c) Streptomycin 1 gm daily is highly effective in inhibiting the growth of colonic bacteria and prepares the colon for surgery within 3 days.

(d) Aureomycin 750 mgms a day, divided in 3 doses, is also very effective and the colon is cleared of all bacteria in 3 days.

8. Colonic irrigation with saline is given daily.

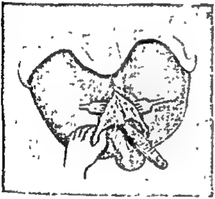
On the morning of operation, an enema is given at 6 A.M. and a rectal tube passed about 7 A.M. and left *in situ* till the end of the operation so that it empties all the fluid that is retained in the colon.

6. Semi-solid food can be given on the 5th or 6th day and normal diet on the 10th day.

7. Liquid paraffin to be given orally on the 4th day and, if the colostomy has not started functioning, a rectal tube should be passed very gently after consulting the surgeon and olive oil or liquid paraffin is introduced through the tube to soften the faecal matter that may be present in the splenic flexure or transverse colon.

8. The paramedian incision should be protected from the colostomy wound by a water shed dressing.

9. Sutures are removed on the 10th day.



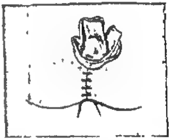


Fig 33 Fig. 34

Fig. 33 shows Perineum being packed. A large rubber dam (with perforations to facilitate drainage) is carefully placed in the perineum followed by packing the defect with five yards of roller gauze. Fig. 34 shows Perineum drained & final appearance after the wound is sutured in front & behind the packing

The colostomy wound is usually closed with a clamp for 48 hours and, by this time, the colon gets adherent to the peritoneum all round. If the patient has any distension, the clamp can be released for decompression and finally removed on the 4th post-operative day at which time the first dressing is done The colour of the bowel that is projecting out should be noted as, in some cases, if the opening in the abdominal wall is narrow, the loop of bowel projecting gets congested,

8. No enema should be given.

9. On the 4th or 5th day after operation, patient may be given 1 oz. of liquid paraffin by mouth.

10. After the patient passes flatus Wangenstein's suction is discontinued and liquid diet is ordered on the 5th day of operation, soft bread, jelly, pudding, custard, biscuits given on the 7th or 8th day, and normal diet like rice and curds on the 12th day.

11. Drainage tube to be removed 48 to 72 hours later depending upon the drainage.

12. Sutures to be removed on 10th or 11th day.

Post-operative treatment for Colectomy (partial or complete)

1 Morphia every 8 to 12 hours for 3 days.

2. Fluids and Vitamins given and Wangenstein's suction continued just as for right hemicolectomy.

3. Small blood transfusion on 3rd or 5th day.

The rest of the post-operative treatment is similar.

Abdomino-Perineal Resection

Post-operative treatment :

1. Wangenstein's suction attached to Ryle's tube is continued for 4 or 5 days.

2. Intravenous fluids and Vitamins given daily until Wangenstein's suction is discontinued.

3. Chemotherapy or antibiotics given as mentioned above.

4. Retention of urine is treated by passing a catheter into the bladder and connecting it to a bottle for 4 days.

5. Liquid diet to be given on 3rd or 4th day after the patient had an evacuation of the bowel through the colostomy opening.

rest to the diseased colon. The patient is treated medically during the post-operative period by giving: -

(1) Blood transfusion,

(2) Bowel washes,

(3) Sulphaguanidine retention enema,

(4) Penicillin and Sulphonamides,

(5) Or any of the latest antibiotics like Chloromycetin or combinations of Chloromycetin and Streptomycin.

This procedure of ileostomy helps to improve the condition of the patient and renders him fit to undergo a major operation like total colectomy.

Patients with ileostomy may have some trouble in controlling the discharge that is escaping. A proper diet and any of the modern ileostomy belts fixed to the skin by a special adhesive solution may make the life of the patient tolerable.

Caecostomy

This is done in cases where the patient has got a malignant growth of the transverse colon or hepatic flexure. This operation is performed under general or local anaesthesia. A Paul's tube which is fixed to the caecum is connected to a bottle by a rubber tube. The drainage of the small intestines can be continued for 2 or 3 weeks and thus it has been used as a preliminary to the removal of bowel growths. Caecostomy is only a temporary expedient and is not intended for permanent drainage. Indeed, drainage of the caecum and right colon is attended with so much of discomfort owing to the fluid discharge, that a permanent opening is avoided as far as possible. The large bowel can be washed through the caecostomy tube every day Before any surgery is undertaken, a rectal tube is passed and the whole of the large bowel is washed and debacterialised When the bowel is being washed through a rectal tube, the fluid escaping through the caecostomy

bluish in colour, and later gangrene may set in. In such cases, as soon as the congestion and bluish discolouration are noted, some of the stitches should be removed and the constriction relieved.

Perineal wound should be dressed daily and any bleeding should be noted. On the 3rd day, about half the gauze pack is removed gently and, on the following day, it is completely removed The rubber sheet should be removed along with the gauze pack in the perineal wound on the 4th day. The perineal wound is then subsequently dressed with vaseline gauze and a T bandage applied. Perineal stitches can be removed on the 12th day

Ileostomy

This is done in cases of ulcerative colitis where it is intended to give the colon complete rest or as a preliminary to a total colectomy. The tube which is attached to the ileum for drainage is connected to a bottle. The skin round the ileum is protected with vaseline gauze. In some clinics, Tr. of Benzoin dressings are applied round the ileostomy and this has proved to be a most effective way of protecting the surrounding skin until the ileostomy bag is applied Skin irritation is much easier to prevent than to cure. If it does occur, one may have to resort to the application of aluminium powder, Kaolin or a [illegible]% solution of tannic acid or a face down position on a Bradford frame so that healing of the skin may occur before an ileostomy bag is fixed. The Koenig-Rutzen bag was the first of the modern ileostomy bags and it is still the ideal one for most patients.

Post-operative vomiting or the loss of large quantities of fluid, chlorides, potassium and other electrolytes through the ileostomy may quickly alter the fluid and electrolyte balance of these patients If this is not recognised and treated, the clinical condition of the patient rapidly deteriorates Blood chemistry investigations are necessary for this purpose. Later on, the patient is placed on a low residue diet of high caloric value. In ulcerative colitis, ileostomy helps to give complete

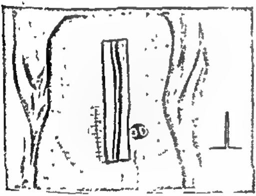
a course of sulphapthalidine. The rest of the preparation will be the same as for any major abdominal operation and the pre-medication should be according to the anaesthetist's choice.

Post-operative care in these cases would be as follows:

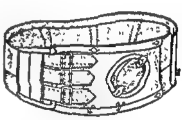
1. When the colostomy is done for Intestinal obstruction, the colon is opened by a cautery immediately to relieve the distension. In all other cases the opening of the bowel is done after 48 hrs.

2. The skin all round the bowel is protected by vaseline gauze and if the patient has had a laparotomy incision also, the wound should be protected by a watershed.

The bowel that is exposed is covered by vaseline gauze.



(c)



(d)

FIG 35(c) Watershed dressing used to separate the Laparotomy incision from a colostomy or caecostomy. *Inset*—Approximation of strips of Adhesive plaster and the ends folded as shown in diagram to be applied on the abdomen. (d) Colostomy cup ■ Belt (for use in left sided colostomy.

The management of a colostomy will depend upon the mental make-up of the patient and the interest he takes in his "Colostomy life". The colostomy begins functioning after 48 hours and it could be helped by giving the patient mild aperients. Purgatives should be avoided as it produces

opening will give an idea whether the bowel has been cleaned properly or not.

Management of Colostomy

There are two types of colostomies done for patients.

(a) A permanent variety which is done for cases of cancer of the rectum when an abdomino-perineal excision has been made;

Or, in cases where the patient has an inoperable cancer of the rectum, a spur type of colostomy is done to prevent any faecal matter going into the rectum.

(b) Temporary colostomy is done for:

(i) cases of Cancer of the Sigmoid,

(ii) in cases of Volvulus of the sigmoid colon.

In these cases, the proximal and distal limbs of the pelvic colon are sutured so that a spur forms between the two limbs.

The pre-operative preparation for these cases is similar to operations on the rectum or colon.

(a) (b)

FIG. 35 (a) Depending on the condition of the patient 24 to 48 hrs. later, the colostomy is opened with a cautery. Notice the colostomy is opened longitudinally along the anterior Taenia. (b) This diagram shows the appearance of a colostomy on a patient 4 weeks after surgery.

The dehydration, anaemia, and protein deficiency are corrected and the patient is placed on a low residue diet. Debacterialisation of the colon is done by giving the patient

To protect the colostomy opening, a number of belts are available. The belt selected should fit the colostony and is worn all through the day. During the night, it is removed and the colostomy opening is covered with vaseline gauze and cotton wool. These patients with colostomy should be asked to report regularly.

Post-operative treatment after Paul Mickulikz operation:

1. The spur of the colostomy is crushed after 2 weeks. This can be done by an enterotome or by a haemostat.

2. After the spur has been crushed, the patient must be prepared for closure of colostomy, the preparation being the same as for a colectomy or abdomino-perineal resection with one important instruction, i.e., the proximal and the distal bowel should be washed for 2 days (morning and evening) prior to operation.

A drain that is kept after closure of colostomy is removed on the 5th or 6th day.

severe diarrhoea and it puts the patient to considerable difficulty in controlling the colostomy stoma. The laxatives that are usually given are liquid paraffin or milk of magnesia. By suitable regulation of the diet, the need for passing large motions through the colostomy is avoided.

The patient should carefully avoid certain foods like green vegetables, fruits, figs, tomatoes, onions, and peas. Alcohol should likewise be avoided. Usually, the patient can within a month or two find out what diet is suitable for him.

The colostomy can be washed by passing a catheter and running in soap and water solution. This is usually done in the morning after breakfast. Some patients do it daily and this procedure has a drawback. The colon mucosa gets thickened and occasionally, spasm of the bowel occurs. If this complication occurs, the wash-out routine is discontinued.

(a) (b)

FIG. 36(a) Method of applying Enterotome to crush the spur between the Proximal and Distal Segments (b) Diagram showing sectional view of colostomy after crushing the spur.

The other routine for management of these colostomies is to allow it to act naturally without wash-outs. If the patient becomes constipated, he is given liquid paraffin at bed time and prunes and bananas may be taken with the evening meal. In about 5 weeks time, the colostomy acquires a rhythm.

area should be attended to—cleaned and dressed after each act of defecation. The patient can be allowed to move about on the 2nd day and is discharged in a week's time and is advised to attend for the dressings every day. A gloved finger lubricated with olive oil is passed to dilate the anal canal about the 7th day after operation, and this is repeated daily when he comes for dressings. Lack of after-care and failure to pass a finger may result in a stricture.

Patient may be given chemotherapeutic drugs for the first three or four days after the operation.

Retention of urine is an important complication that may occur after haemorrhoidectomy. The usual methods are tried before a catheter is passed.

The ligatures that are applied over the pile masses usually fall off by about the 8th or 10th day. If they still remain after the 12th day, they could be removed by gentle traction.

Piles

Injection treatment is done for the first or second degree piles. The principles of injection treatment are:

1. To stop bleeding by obliterating the capillary and venous spaces;

2. To produce a sub-mucous sclerosis and to prevent the mucosa from sliding down when the patient strains for defecation.

Preparation: The patient gets an enema the previous evening. The solution used is a 5% solution of Phenol in almond oil to which two grains of menthol to the ounce has been added.

The patient is placed in the left lateral position and the proctoscope lubricated and inserted. As the proctoscope is being withdrawn, the pile masses will be bulging into the lumen of the instrument The pile masses are noted and the needle is passed under the mucous membrane slightly above

CHAPTER 14

RECTAL SURGERY

Haemorrhoidectomy

The pre-operative management consists in:

1. A routine blood and urine examination.

2 Proctoscopic or sigmoidoscopic examination.

3. The perineum, abdomen and the back are shaved the previous evening, enema is given on the night before the operation and again in the morning. Patient may have a bed coffee but no feeds after that.

4. An Anti-tetanic serum injection is given for all cases of Rectal surgery the previous day.

The post-operative treatment will be as follows:

1 Morphia, ⅓ gr I M to relieve the pain.

2 For the first 2 days after operation, patient is on liquid diet; on the 3rd day, semi-solid diet is given; and on the 4th day, normal diet.

3 On the 3rd day after operation, patient is given 1 oz. of liquid paraffin at bed time.

4 If no bowel movement occurs by the 4th post-operative day, the patient is given a glycerine or olive oil enema

5. Patient usually has a drainage tube placed in the anal canal to reveal any concealed haemorrhage that may occur due to slipping of ligatures and for the passage of flatus. This tube is removed after 24 hours

The house officer should watch for any signs of bleeding. After the enema has been given, the wound is washed with Dettol or Eusol lotion and it is dressed with Penicillin or Sulphanilamide ointment or vaseline gauze. The operated

be pushed in more deeply or withdrawn and re-introduced. About 3 to 4 injections are necessary for the 3 primary pile masses. After the injection, a gentle massage is done with

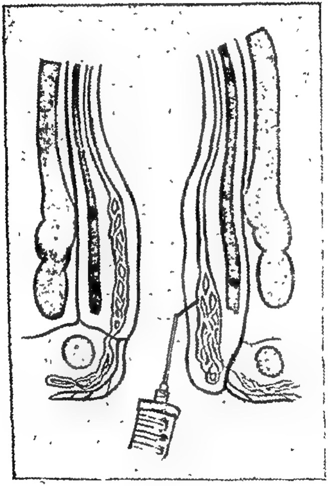


FIG 38 Diagram showing the site for injecting a Haemorrhoid

the gloved finger introduced into the rectum. The rectal mucosa may be cleaned and gentle pressure may be applied with a finger if there is any bleeding at the site of puncture for pile injection.

the anorectal ring and 2 to 3 c.c. of the solution is injected. As the injection is being given, the mucous membrane

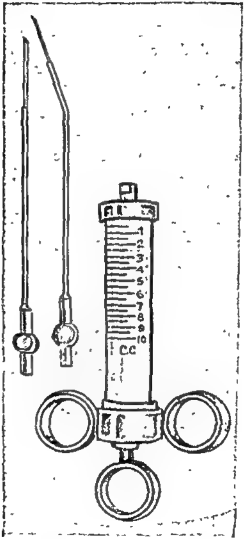


FIG 37. Haemorrhoid Syringe Gabriel's for the Submucous injection of phenol in oil

stretches and becomes pale. If the mucous membrane becomes pale after ½ c.c has been injected the needle must

3. Blood for Wassermann and Kahn should be done as a routine as some patients are likely to have syphilitic ulceration or proctitis.

4. In cases of strictures of the anal canal, it may be necessary to do a Frei's test also.

Post-operative management is the same as for piles.

Proctoscopic and sigmoidoscopic examination:

The preparation of the patient before this examination is the same as for piles.

1. An enema should be given the previous night and repeated in the morning.

2. Morphia ¼ gr. with atropine 1/100 gr. half an hour before examination.

3. Examination of the motion to eliminate amoebic infection.

4. If ulcers are seen through the proctoscope or sigmoidoscope, a smear should be taken for microscopic examination and the margin of the ulcer for pathological examination.

Prolapse of the Rectum

The same pre-operative management is done as for a case of piles. In addition, the following treatment is adopted: —

1. The patient is given Sulphapthalidine or Pthalyl Sulphathiozole for 3 days before operation.

2. Bowel washes are given the day before operation and on the morning of the day of operation.

Post-operative instructions after Rectopexy are: —

1. Sulphapthalidine is continued for 5 days after operation.

2 Liquid diet is given for about 5—6 days.

3. Patient is given a binding mixture with Tr. Opii, 5 minims, three times daily

After-treatment: No after treatment is required and the advice generally given is that violent exercises like tennis and other games should be avoided for [illegible] week or ten days.

The bowel movement is allowed to take place the next day by giving the patient a mild aperient. If the patient has a prolapse of the piles, it should be immediately replaced by digital pressure. Complications that may occur are: —

(a) Chemical necrosis and sloughing is likely to occur due to overdosage or wrong injection or re-injection into the sclerosed tissue. This is treated by the application of [illegible] % Mercurochrome every other day.

(b) The next complication may be submucous abscess which may require opening up

(c) Stricture of rectum has been known to have occurred after injection, especially when a wrong solution is used. Such an accident is likely to occur when pure phenol is used.

(d) Secondary haemorrhage is another rare complication after injection treatment for piles.

In cases of pregnancy complicated with piles, injection treatment is adopted. During the first [illegible] months of pregnancy, regulation of the bowels, avoidance of prolonged standing and injection treatment may help the patient to overcome this troublesome complication.

Injection should never be given for external piles.

Fistulectomy and Fissurectomy

The routine pre-operative procedures mentioned above are adopted in these cases. In addition, the following investigations are done:

1. X-Ray of the chest should be done as [illegible] routine as some of these fistulae may be tuberculous.

2. Biopsy of the fistula or sinuses may be necessary to eliminate cancer.

After the operation, the post-operative care is as follows:

(1) Shock is combatted by the usual methods.

(2) Antibiotics or Chemotherapeutic drugs are given.

(3) Sulphaguanidine or Pthalyl Sulphathiozole is continued for 4 days.

(4) No enemas are given for these patients.

On the 5th night, the patient is given a mild aperient.

If there are hard faecal mases, they should be removed very gently by means of the gloved finger after introducing 3 to 4 ozs. of olive oil through a fine rubber catheter.

In the post-operative period, the patient is asked to exercise his anal sphincter by repeatedly contracting and relaxing it so that its tone might recover.

The patient should be in bed for about 16 to 18 days. A gloved finger must be passed every four or five days and the suture line carefully examined. If necessary, a small proctoscope is passed and it is gently irrigated with warm lotion.

In cases of laxity of the anal sphincter in old people, a Thiersch operation can be done. The bowel preparation for these cases would be to give an enema morning and evening before the operation. After the operation, the patient has usually no bowel movement for a couple of days. On the evening of the 2nd day he is given a mild aperient and on the 3rd day after the operation, he is given an olive oil enema.

The skin sutures are removed on the 8th day. The wire can be left indefinitely if no infection occurs. If infection occurs, it has to be removed.

Perineal excision of rectum is done in cases of growths in lower third of the rectum. A preliminary colostomy is performed 2 to 3 weeks before excision and the lower segment of bowel is washed through daily. A small catheter is passed through the distal opening of the colostomy and

4. Saline enema is given on the 6th day with the patient lying in the left lateral position and he is advised not to strain during defecation.

5. The gauze packing is removed on the 6th or 7th day after operation under anaesthesia and the wound repacked and allowed to heal from the bottom.

6. The wound takes about 2 to 3 weeks to heal.

7. During the first week, chemotherapeutic drugs are administered.

Recto-Sigmoidectomy

This is done in cases of complete prolapse of the rectum. The investigations that are done for these cases are:

1. Routine urine examination.
2. Blood examination,
3. Motion examination for any evidence of amoebic or bacillary dysentery.
4. Barium enema and X-Ray picture.
5. General examination of heart, lungs, etc.
6. Blood pressure and pulse rate are recorded.
7. Blood chemistry is done, if necessary.

The pre-operative preparation for these cases would take at least 3 days. The patient's general condition should be improved and a non-residue diet is given to him. He must have Sulphaguanidine or Sulphasuccidine by mouth for 3 days and a complete debacterialisation of his colon is done before the operation Colon wash must be done on the previous day of the operation, both morning and evening. The perineum is shaved and cleansed with ether soap. The pre-operative medication is given after consulting the anaesthetist.

On the day of the operation, no enema is given and a flatus tube is passed to remove all fluid that may be present in the rectum.

normally formed. These patients may come for treatment within the first few days of life. The parents usually bring the child complaining that there is no anal opening, and that the child has not passed any motion. In some cases they may come with the history saying that meconium comes through an abnormal opening either through the vagina, urethra or perineum,

The patient with imperforate anus usually comes for examination in 36 to 48 hours after birth and may have all the

Fig 39 Roentgenograms of two babies who had imperforate anus X-rays of babies in head down position with a metal button at the anal dimple. This reveals the amount of tissue intervening between the blind Rectum and the anal dimple.

signs and symptoms of a large gut obstruction. The infant has abdominal distension, vomiting, dehydration and in the later stages collapse. A careful examination must be done (a) to find out whether the anal opening is absent or abnormally

the sigmoid and rectum completely washed. Post-operative haemorrhage and shock is combated by blood transfusion. This is followed by I. V. fluids to maintain the fluid balance.

The packing gauze that had been used to prevent any oozing from the perineal bed after removal of the rectum, is removed in 3 or 4 days. Half of the packing gauze is removed on the 2nd day and the rest on the 3rd or 4th day. There may be a little discharge which is treated by irrigations. In cases where patient has retention of urine an indwelling catheter is connected to a bottle containing antiseptic lotion. The perineal wound takes about three weeks to heal. In some cases there may be troublesome mucous discharge and a perineal fistula results.

Imperforate Anus

Malformations of the anus or rectum can be interpreted as arrests or abnormalities of development in the 7th or 8th week of the intra-uterine life. The rectum may have connections with the genito-urinary tract. The types of the fistulae that may occur are: (a) recto-urethral, (b) recto-vesical, (c) recto-vaginal.

In some cases the rectum may open in front of the anal dimple and give rise to a recto-perineal fistula.

In the case of anal anomalies the types that are constantly met with are:

1 Congenital anal stenosis which may occur at the anus or at any level in the anal canal.

2. Membranous imperforate anus which may be due to persistence of anal membrane.

3. In this type, the rectum ends blindly at some distance above the anus.

4. The rectal pouch in this type ends blindly in the hollow of the sacrum and the anal pouch and anus are

Pre-operative treatment:

(1) Fluids to combat dehydration.

(2) Wangenstein's gastric suction.

(3) Vitamins parenterally.

Post-operative treatment:

(1) Shock to be combated by fluids and blood when the Abdomino-perineal operation is done

(2) Bladder drained by catheter for the first few days.

(3) The child to be put on a milk formula by the Paediatrician.

(4) Antibiotics.

(5) Rectal dilatations to be started after the 15th day and repeated every three months for a year or two.

(6) Laxatives in the form of agarol and lubricants like liquid paraffin are given to soften the motion, if necessary.

The complications that are likely to occur are:

(1) Anal stricture, prevented by repeated dilatations.

(2) Recurrence of fistula which must be corrected by a second operation.

(3) Faecal incontinence.

placed, (b) examination of the perineum to find out whether the anal sphincter is formed and whether there is any impulse when the baby strains or cries.

Investigations :

(i) Examination of Urine: To find out if there is any meconium which indicates recto-urinary fistula.

(ii) Roentgenological examination to find out where the rectal pouch ends and to note the distance from the rectal pouch to the anal dimple. Before taking an X-Ray the infant is held with its head down so that the gas in the colon will rise and outline the distal portion of the rectal pouch. X-Ray pictures taken in this position, in the lateral and anterio-posterior planes are extremely helpful in estimating the position of the rectal pouch.

(iii) To find out the distance from the anal dimple to the rectal pouch, a small metal piece is placed over the anal dimple and strapped before taking the picture.

The distance between the gas filled rectal pouch and the metal piece helps the surgeon to decide on the nature of the operation

If the X-ray picture is taken within 12 to 18 hours, the rectal pouch may not be outlined by gas because of sticky meconium.

The types of operations that are done :

(a) Colostomy, when the rectal pouch ends high up.

(b) Perenial operation where the distance between anal dimple and rectal pouch is less than 1 c.m.

(c) Abdomino-perineal approach in infants whose general health is very good and where the distance between the anal dimple and the rectal pouch is more than 8 cm.

4. Prothrombin time.
5. Liver function tests.

(a) Bromsulphalein test: This is widely used as a test for estimating liver function. A measured amount of the dye Bromsulphalein or Sodium Phenol Tetraiodopthaleine 2 mgm per Kgm body-weight is injected intravenously and then 5 c.c. of blood is withdrawn at intervals of 15 minutes, 1 hour and 2 hours. Normally, 5—7 % of the dye remains in the blood after 15 minutes and only traces after an hour. In the presence of liver damage, 30 %, 40 % or even 50 % of the dye may be retained in a 2 hour specimen of the blood. This test is therefore useful in determining the extent of liver damage. *This test has not been satisfactory in the presence* of jaundice and if the Serum Bilirubin is more than 5 mgm/100 c.c., the test cannot be relied upon. (*This test is therefore useful in determining the extent of liver damage.*)

(b) Hippuric acid test is based on the detoxifying function of the liver and, in particular, its ability to effect *synthesis* of Hippuric acid from Benzoic acid and Amino-acetic acid. This test, known as Quick's test, is done as follows 6 gms. of Benzoic acid is administered orally to the fasting patient and urine collected 4 hours later. The amount of Hippuric acid in the urine is determined. In normal persons, the excretion of Hippuric acid ranges from 2.5 to 3.5 gms A reduction of 50 % from normal means an unfavourable post-operative course. If the excretion is only 1 gm. in 4 hours, the risk of a surgical operation is great. If it is only ½ gm., surgery is contraindicated. The disadvantage of this test is that if the patient has renal damage, the above test cannot be relied upon.

(c) The cephalin-cholesterol flocculation test is a sensitive test based on the relative proportion of the proteins in the plasma. It is of great value in determining the extent of liver damage in diseases of the liver like cirrhosis, acute hepatitis and catarrhal jaundice but cannot be relied on in cases of obstructive jaundice and acute cholecystitis. Together with other tests of liver function, this test is of value in

CHAPTER 15

SURGERY OF THE GALL BLADDER AND BILIARY TRACT

Operations on the gall bladder and biliary duct may be performed during the acute or sub-acute inflammatory stage or later. The advantage of early operation is that peritonitis from perforation is avoided but, since this is rare, operation is done at a later stage after the actute inflammatory reaction has subsided when the exposure of the duct is easier. Before an operation on the gall bladder or biliary tract is performed, the liver function should be studied. The liver has a variety of functions and hence it has been called "the commissariat" of the body. Substances necessary for coagulation of the blood are produced by the liver. It also furnishes the anticoagulant Heparin. The liver synthesises and excretes bile salts necessary for the digestion and absorption of fats, the liver also has an important role in haematopoiesis. The function of the liver which has been recognised most recently is the part that it plays in the synthesis, storage and absorption of Vitamins. Damage of the liver has been shown to have an adverse effect on these functions. Bile is essential for the proper absorption of the fat soluble Vitamins A, D and K. The administration of Vitamin K is not indicated except in cases where jaundice is present or unless Vitamin K deficiency is found as demonstrated by a prolonged Prothrombin time, which may occur in diseases of the liver or intestines like regional ileitis, ulcerative colitis and neoplasms

The following are the important investigations which should be done before surgery of the gall bladder or biliary tract is undertaken: —

1. Complete blood count, Haemoglobin percentage and differential count.
2. Routine urine examination.
3. Examination of the stools for occult blood or bile.

5. Vitamin K is given orally or parenterally daily for about 3 or 4 days to restore the normal prothrombin time.

6. Bile salts should be given, 5 grains 3 times a day if Vitamin K is given orally.

7. Vitamin C is also given by injection daily for about 3 days before operation.

8. The diet of these patients should contain an abundance of carbohydrates. Plenty of sweetened drinks can be given. Proteins in the form of bananas, skimmed milk and cheese may be given. Fats should be eliminated from the diet.

9. Blood transfusion is of value in the prevention and treatment of haemorrhagic diathesis associated with jaundice. It is often given pre-operatively in jaundice patients in order to combat hypoproteinaemia, secondary anaemia or hepatic failure.

The following instructions should be given to the nurse when the patient is posted for operation.

1. Patient to have a normal dinner at 8 P.M. previous night.

2. Breakfast is omitted.

3. Chest, abdomen and back to be prepared.

4 Soap and water enema to be given the previous night and on the morning of operation.

5. Ryle's tube to be passed into the stomach just before sending him to the operating room.

6. 5 % glucose saline, 2 bottles, and 500 c.c. of blood should be kept ready in the operating room to be given to the patient during operation, if necessary.

7. Pre-anaesthetic medication after consulting the anaesthetist.

Post-operative management:

1. Treatment of the shock by giving blood transfusion followed by saline.

2. Position of the patient in bed will depend upon the type of anaesthesia given and the patient's condition. After the patient has recovered from the anaesthesia, the patient

determining the operative risk in disorders of the biliary systems where liver cell damage has been present.

6. (a) Vandenberg's quantitative and qualitative reactions. (b) Icteric index.
7. Serum Bilirubin content.
8. Serum amylase test.
9. Serum proteins, albumin and globulin ratio.
10. Serum cholesterol determination.
11. X-ray of chest.
12. Cholecystography.
13. Urea clearance and blood urea.
14. Blood sugar determination.
15. E.C.G.
16. Wassermann and Kahn.
17. Bleeding time and coagulation time.
18. Blood group of patient.

Pre-operative treatment:

When a patient comes with symptoms of acute cholecystitis, a careful watch should be maintained. Pulse is recorded every half hour.

Fowler's position is adopted with application of hot water bottle or heat to the upper abdomen. Ryle's tube is passed into the stomach and continuous suction is established. Intravenous glucose or glucose saline is given if the patient has severe vomiting. Purgatives are avoided during the period of treatment and, if bowels do not move, a glycerine enema may be given.

Pre-operative care for these cases is as follows:

1. Chemotherapeutic or antibiotic drugs to control infection.
2. Ryle's tube is passed into the stomach just on the day of operation.
3. Fluids in the form of 5% glucose saline or 5% glucose in distilled-water to combat any dehydration present.
4. Protein hydrolysate is given if hypoproteinaemia is present.

9. Enema to be given on the 3rd day and to be repeated on alternate days, if necessary

10. The drain placed in the Morrison's pouch can be shortened daily after the 6th post-operative day and removed completely by about the 10th day. The drainage usually ceases after a few days. If the drainage is very profuse and begins several days after operation, it is probable that the ligature on the cystic duct has come away. If the drainage is small in amount, it may be due to bile coming out from the gall bladder bed in the liver. If the biliary drainage is very profuse after operation and continues so, it might be due to an injury to the common bile duct, especially if the operation is attended with technical difficulties. In a simple cholecystectomy, there is very little biliary drainage.

11. Skin sutures are removed on the 10th day.

The pre-operative treatment mentioned above, as well as the post-operative care, is the same for cases of cholecystitis and gall stones.

Common Bile Duct Obstruction

This may occur as a result of stone in the common bile duct or it may be due to a stricture that has occurred after a cholecystectomy.

Pre-operative treatment:

During this period, the laboratory procedures mentioned above for acute cholecystitis have to be done. In particular,

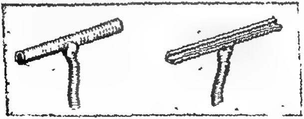


FIG. 40(a) Diagram showing T. tubes used for draining the common bile duct.

the hepatic and renal function tests should be carried out in every case. The bleeding time, coagulation time and a

study of the Prothrombin time and its response to Vitamin K therapy must be noted.

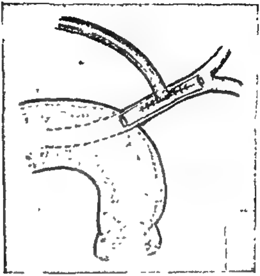


FIG. 40(b) Diagram showing the T tube sutured into the common bile duct for drainage.

Preparation:

1. Dehydration is corrected by checking the fluid balance. Intravenous fluids, 5% to 10% glucose in water, is given for these patients. The diet should contain plenty of carbohydrates with a good amount of proteins during the pre-operative period. Fat should be eliminated from the diet. Blood transfusion is indicated pre-operatively in jaundiced patients to combat secondary anaemia, hypoproteinaemia, hepatic failure and as a prophylactic against operative shock.

2. Vitamin K preparation and Vitamin C, 500 to 1000 mgms. should be given intramuscularly daily.

3. Calcium gluconate, 10 c.c. of 10% solution, is given daily for two or three days before operation

4. Antibiotics like Penicillin, 5,00,000 units, twice a day should be given in the pre-operative period.

A careful preparation of the patient will check or prevent post-operative complications like renal failure, hepatic failure and a tendency to bleeding during operation.

Post-operative care :—

The same post-operative care as employed for cholecystectomy cases is followed in cases of choledochostomy.

1. The T tube draining the common bile duct is connected to a feeding bottle which is strapped to the side of the patient.

2. If the tube becomes blocked, 5 c.c. of warm sterile solution of normal saline can be used to wash it off.

3. The amount of bile drained should be recorded daily.

4. Clamping the tube may be done gradually as soon as the patient's condition has improved and the colour of the stools has returned to normal. Five days after the operation, the clamping of the tube is started at first for an hour in the morning and an hour in the evening. This period is increased daily till the tube remains clamped the whole day. Any leakage of bile by the side of the tube or abdominal colic or pain or elevation of temperature should arouse the suspicion of a persistence of obstruction of the common bile duct or a spasm of the sphincter of oddi. Examination of the motion also will reveal whether bile is passing into the intestinal tract.

5. Before removal of the tube, a cholangiogram should be performed in order to show the free passage of radio opaque dye into the duodenum. The cholangiogram will show the size of the common bile duct and whether there is any obstruction or filling defect. The T tube should not be removed until a normal cholangiogram has been obtained and the surgeon has given his approval for its removal. In those cases where a plastic repair of the common bile duct has been done, the tube may have to be kept in position for 3 or 4 months. The removal of the tube is not difficult and can be done by exerting a steady traction upon the vertical limb of the tube. In some cases, it may be difficult if the surgeon has left a long horizontal limb within the common bile duct.

In fact, these horizontal limbs should be shortened to a length just sufficient to allow them to be retained in the duct after the opening in the duct has been sutured over them.

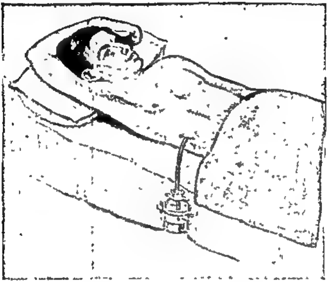


FIG 40(c) Diagram showing the T tube coming out of the Abdomen through a stab incision made in the loin This tube is allowed to drain into a bottle strapped to the side of the bed or patient.

If the T tube has to be left for a long period, it has to be washed with a 5% solution of Soda Bicarb to dissolve the bile salts and Bilirubin which may be deposited over the tube After the T tube has been removed, a small amount of bile may drain for a week or ten days.

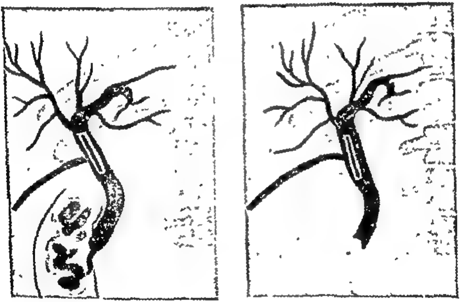
6 Prothrombin time should be estimated on alternate days especially if it is prolonged. The patient should have Vitamin K and Vitamin C injections daily during the post-operative period.

7. Icteric Index can also be done every week to see the progress of the patient.

The two important post-operative complications are:—

1. Hepatic failure; and
2. Renal failure.

Hepatic failure is manifested by restlessness, delirium, muscular twitchings, hyperpyrexia and coma. Death occurs too soon to be explained as due to infection and too late for surgical shock. In order to prevent this liver failure, the surgeon should have a good idea of the patient's liver function in the pre-operative period. Such failure is prevented by giving plenty of carbohydrates, vitamins and by the maintenance of fluid-balance. Blood transfusion may be indicated when the liver is badly damaged. Protein hydrolysate preparation by mouth and multivitamin tablets help the patient to recover quickly.



(a) (b)

Fig. 41(a) Normal cholangiogram showing the opaque medium outlining the duct and flowing freely into the Duodenum. (b) Cholangiogram showing an obstruction at the ampullary end of common bile duct probably due to a stone.

The renal failure is probably due to the toxic products that are being passed out through the tubules due to hepatic insufficiency. The operation in these patients should be deferred until the renal function is restored to normal.

CHAPTER 16

SURGERY OF THE LIVER

Before any operation on the liver is done, the function of the liver must be carefully assessed by doing:

(i) Quicks Hippuric Acid Test,

(ii) Bromsulphalein Dye Test,

(iii) Cephalin Cholesterol Flocculation Test,

(iv) In addition, patient must have the routine blood studies, urine examination and kidney function tests.

Hypoproteinaemia, vitamin and prothrombin deficiencies must be corrected before the patient is operated. Patient is put on a high protein, high carbohydrate diet.

Those patients who have chronic hepatitis or cirrhosis or liver disease must have Methionine preparation to prevent fat deposition in the liver

Anaemia should be corrected by blood transfusion.

For cases of partial hepatectomy, the usual preparation is done as for any major abdominal operation. In the post-operative period, shock is combated by blood transfusion, and intravenous fluids are given till the patient is able to take nourishment by mouth.

The drainage tube from the region of the liver may contain bile. The tube can be shortened as soon as the discharge becomes less and less.

Hydatid Disease of the Liver

In cases where the liver is suspected of being affected by Hydatid disease, the following tests are usually done:—

(i) Casoni's reaction.

(ii) Chedini-Weinberg complement fixation reaction.

(iii) Plain X-ray of the liver to find out if there is any elevation of diaphragm and any calcification of the cyst wall.

(iv) Blood examination—RBC count, WBC count and differential count.

In cases where suppuration has occurred, a rise in the WBC count and a fluid level may be seen in x-ray picture if the infection is due to anaerobic organisms.

The treatment is operative and great care must be taken to prevent complications like dissemination of daughter cysts, anaphylaxis, liver haemorrhage and liver failure.

In many cases, the cyst wall is marsupilised or the cyst is drained.

Tropical Abscess of the Liver

In these cases, the following investigations are done:

1. Plain X-ray of the liver area to find out whether there is any upward enlargement of the liver.

2. Blood *examination, specially a WBC and differential* count.

3. Motion examination to find out if there are any amoebae or cysts.

4. Sigmoidoscopic examination to find out if there are any dysenteric ulcers, and smears taken from the site of the ulcer to find out if there are any cysts or amoebae.

Emetine treatment is given immediately before and after aspiration.

Plain X-ray of the liver area is again taken after aspiration to find out the level of pus in the abscess cavity in the liver. This is demonstrated by a shadow, the result of air entry into the abscess cavity during aspiration. This gives us an idea of the size of the abscess cavity.

Sub-Diaphragmatic Abscess

This usually occurs due to:—

1. Gastric or duodenal perforation or leaks.
2. Appendicular conditions like suppurative or gangrenous appendicitis.
3. Hepato-biliary conditions

FIG. 42 Plain X-ray of the Liver area showing fluid level due to a subdiaphragmatic collection of pus The gas and fluid level under the Rt dome of diagphragm is diagnotistic of subdiaphragmatic abscess

The investigations to be done are:—

1. Plain X-ray of the liver area to find out if there is any fluid level under the diaphragm.

2. WBC and differential count.

3. A fourth hourly temperature chart to see the progress of the case.

Patient is put on a course of antibiotics, streptomycin and penicillin or any one of the broad spectrum antibiotics can also be given.

The abscess is drained extra-pleurally or extra-peritoneally, the anterior or posterior route employed depending upon the position of the abscess. The drainage tube is shortened as the discharge lessens.

Liver Biopsy

Needle biopsy of the liver has been employed in recent years with increasing frequency. It is used to diagnose the nature of liver disease and to determine the degree of liver damage. Liver function tests together with the histological picture as shown by needle biopsy may be useful in giving a better picture of the severity and nature of the disease. Sometimes rare and unsuspected diseases of the liver are diagnosed by biopsy. This helps us to prevent an exploratory laparotomy in every case. Tumors of the liver may also be diagnosed by needle biopsy. Negative results of biopsies do not mean that the liver is not affected as the tissue obtained by needle biopsy may not be from the diseased portion of the liver.

Pre-operative preparation.

1. The chest and abdomen are prepared in the usual manner.
2. The skin and subcutaneous tissues are infiltrated with local anaesthesia.
3. The needle is passed through the 9th Rt. Intercostal space in the mid-axillary line.
4. Before the introduction of needle, the patient is asked to hold his breath. Once the needle has gone into the liver, the stylet is removed and the biopsy stylet is introduced for getting a specimen. About 1 cm. long of liver tissue is obtained for histological study.

The needle is then removed and wound sealed with Tr. Benzoin.

Dangers of Liver biopsy.

1. Haemorrhage: Deaths have been reported after liver biopsy and care must be taken to rule out any haemorrhagic tendency. Vitamin K should be given to all patients at least 2—3 days before liver biopsy.

2. Injuries to hollow viscus in the abdomen like the colon or gall bladder may occur if needle biopsy is done through the abdominal route.

Patient should be hospitalized for 2 days before liver biopsy. The Silverman's needle is used for doing a liver biopsy. After the biopsy, the patient should be in bed for at least 24 hours. He should be watched for signs and symptoms of internal haemorrhage. If clinical evidence of severe bleeding or injury to a hollow viscus follows biopsy, of the liver, abdominal exploration may be indicated.

Portocaval Shunt

The single indication for portocaval shunt is hypertension within the portal system. Great care must be exercised in the selection and preparation of patients for surgery.

The following investigations are done before surgery is undertaken.

(a) Examination of blood: R.B.C., W.B.C. and Hb.%, platelet count, bleeding time, coagulation time, prothrombin time and icteric index.

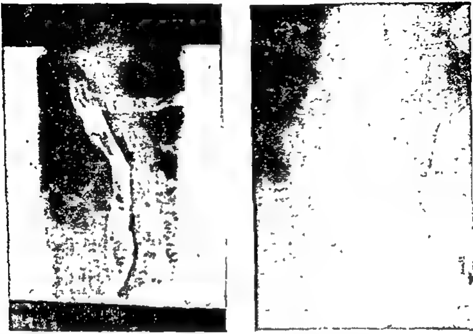
(b) Total serum proteins and albumin, globulin ratio. A reversal of the albumin globulin ratio is present in cases of cirrhosis.

(c) liver function tests.

(i) Bromsulphalein test.

(ii) Hippuric acid test.

(iii) Thymol turbidity.
(iv) Cephalin cholesterol flocculation test.



(a) (b)

FIG 43 (a) Oesophagogram before operation showing varices.
(b) Oesophagogram after operation of portocaval anastomosis showing complete disappearance of all varices.

If there is a high retention of bromsulphalein in the blood thirty minutes after intravenous injection, if the hippuric acid test is positive, if the cephalin flocculation test is positive, the presence of cirrhosis of the liver is fairly certain.

(d) Liver biopsy.
(e) *Renal function.* Examination of Urine. Blood urea, intravenous pyelogram and Urea clearance tests are done.
(f) Oesophagogram to find out whether there are oesophageal varices.
(g) Oesophagoscopy in cases of doubt.
(h) Portovenogram.

With percutaneous spleno-portography, it is possible to make a differential diagnosis between the various types of portal hypertension. In the majority of cases an exact diagnosis based on spleno-portography affords the only reliable guide to the choice of surgical treatment.

These patients should be carefully prepared before surgery is undertaken.

Anaemia, hypoproteinaemia and hypo-vitaminosis should be corrected.

A complete check up of the cardio-vascular and respiratory systems are done.

On the day of operation, the patient must have:

(i) Abdomen and chest prepared.

(ii) Pre-medication after consulting the anaesthetist.

(iii) Ryle's tube passed into the stomach.

(iv) About two litres of blood should be available at the time of operation.

The decision as to whether the individual patient will benefit from an anastomosis is deferred until maximal liver function is attained. In patients whose liver function is within normal limits and who have a portal hypertension producing repeated haematemesis with enlargement of spleen, a spleno-renal shunt is done. In cases where the spleno-renal shunt is not possible and a porto-venogram shows a good-sized portal vein a porto-caval shunt is done. Just before these shunt operations are done, the portal pressure is measured by a saline filled spinal manometer attached by a short rubber tube to an 18 guage needle. The normal pressure is about 100 mm. of water. In cases of portal hypertension, the pressure varies from 400 to 500 mm. of water.

As this operation is usually done by an abdominothoracic route, the post-operative care is similar to any major thoracic operations.

Other complications that are likely to occur in the post-operative period are :—

(i) Abdominal distension or paralytic ileus which can be treated by the usual methods.

(ii) Liver failure or hepatic coma which is treated by giving 300-400 mg. of cortisone by the parenteral route together with glucose and glutamic acid.

In cases of cirrhosis, hormone therapy combined with conventional methods of treatment should be done before surgery. A low salt diet also is prescribed for these patients before surgery. This line of treatment helps to prevent complications like hepatic failure in the post-operative period.

CHAPTER 17

SURGERY OF THE SPLEEN

Patients who undergo splenectomy are usually poor surgical risks and thorough examination is necessary before submitting the patient for operation. This operation is done for cases of thrombo-cytopenia, purpura, Bantis syndrome, congenital haemolytic jaundice, splenic cysts, abscess, tumours, wandering spleens and traumatic conditions of the spleen like rupture, haemorrhage and torsions.

The pre-operative investigations in these cases are:

1. Blood study—WBC count, RBC count, Platelet count, differential count, bleeding time, coagulation time and prothrombin time.
2. Bone marrow examination after sternal puncture.
3. Routine urine examination.
4. Examination of motion.
5. Renal function tests.
6. Liver function tests
7. Roentgenogram of the chest to eliminate any cardiac abnormality or disease of the lungs.
8. An oesophagogram to find out if there are any oesophageal varices.
9. Serum proteins, albumin and globulin ratio.
10. Consultation with a cardiologist and an E.C G.
11. Oesophagoscopic examination, if necessary, in cases of Bantis disease, to find out if there are any oesophageal varices.
12. Blood for Wassermann and Kahn.
13. Intravenous pyelography to find out if there is any abnormality. This is done in cases where a splenorenal anastomosis is to be done.

Pre-operatively, the patient is given a high calorie, high protein and high vitamin diet. If the patient is unable to take it orally, intravenous solutions containing carbo-hydrates, proteins and vitamins are given to correct the dehydration

and starvation. The bleeding tendency created by vitamin deficiency is corrected by giving vitamins K and C. Blood transfusion is given to correct the anaemia in these cases.

Antibiotics are given prophylactically for a couple of days before operation.

The preparation just before the operation consists of:—

1. Enema (soap and water) given on the morning of operation.
2. A Ryle's tube or Levine tube is passed into the stomach and gastric decompression is done before the patient is taken to the operating room.
3. Pre-anaesthetic medication should be determined by the Anaesthetist depending upon the patient's general health.
4. Abdomen and chest to be prepared depending upon whether transabdominal or transthoracic route is employed.
5. A couple of pints of blood should be available when a splenectomy is done and in cases of spleno-renal anastomosis, there must be at least 1500 to 2000 c.c. of blood available.

Post-operative treatment:

1. The amount of blood lost during the operation should be estimated and adequately replaced.
2. Oxygen should be administered through a nasal catheter.
3. The lungs must be well aerated and carbon dioxide inhalations must be given for 5 minutes every hour along with oxygen.
4. Deep breathing exercises and coughing should be encouraged to prevent atelectasis. Tracheobronchial toilet is done by aspiration of all the secretions using a sucker.
5. Renal function should be carefully checked up.
6. Gastric and intestinal decompression is continued for 3 or 4 days to overcome the ileus that usually

follows after splenectomy. The nutrition during this period must be maintained by intravenous glucose and amino-acids. When the patient passes flatus and normal bowel movements have started, gastric decompression can be stopped.

7. If a transthoracic route has been employed for splenectomy, X-ray of the chest is taken to find out whether the lung has fully expanded. The drainage tube from the pleural cavity is removed on the 3rd or 4th day observing all the precautions that have been mentioned under the heading of post-operative care after oesophagectomy.

In cases where the abdominal route has been employed for splenectomy, the splenic bed is drained by a Penrose tube. This is shortened from the 2nd day of the operation and removed by about the 4th or 5th day, depending upon the drainage.

8. Antibiotics are given during the post-operative period.
9. Vitamins B, C and K are continued during the post-operative period.

The complications that are likely to occur after a splenectomy are :—

1. Post-operative haemorrhage,
2. Post-operative thrombosis,
3. Wound disruption,
4. Pulmonary complications and hiccough.

Post-operative thrombosis may occur in cases of Bantis disease and this is corrected by the usual methods.

Post-operative haemorrhage and shock are corrected by blood transfusion

In cases where the post-operative period has been stormy, sutures should not be removed till the 12th day.

Pulmonary complications can be prevented or controlled by the methods mentioned already. In some cases, hiccough is likely to occur due to diaphragmatic irritation and the usual measures are adopted to control it,

CHAPTER 18

PANCREATIC SURGERY

The investigations required are :—

1. A complete blood examination.
2. Urine examination.
3. Stool examination with particular reference to fat and bile.
4. Serum amylase (which usually is elevated in pancreatitis).
5. Serum proteins, albumin globulin ratio.
6. Bleeding time, coagulation time and prothrombin time.
7. Liver function tests.
8. Vandenberg test.
9. Blood urea.
10. Glucose tolerance test in cases of pancreatic adenoma.
11. Plain X-ray abdomen to reveal any pancreatic calculi.
12. Barium meal series to reveal any displacement of the stomach or of the duodenal loop which usually occurs in cases of pseudo-pancreatic cysts and carcinoma head of pancreas.
13. Barium enema (which will reveal the position of the colon in relation to the tumour of the pancreas).
14. Blood chemistry (CO_2 combining power and chloride content).
15. V.D.R.L. test.
16. Cholecystography.
17. Electrocardiogram.
18. Renal function tests.

In cases of acute pancreatitis, the treatment would be:

1. Ryle's tube or Miller Abbot's tube is passed into the small intestines and Wangenstein's suction applied to minimise abdominal distension in acute pancreatitis.

2. Chemotherapy or antibiotics to be given. Terramycin or Achromycin is the drug of choice. In view of the accompanying ileus in acute pancreatitis, antibiotics must be administered parenterally.

3. Intravenous glucose, saline and vitamins are given. Intravenous glucose saline solution should be given in sufficient quantity to supply the daily needs. This may result in hyperglycaemia which may stimulate the pancreas. To control this insulin may be indicated.

4 The restoration of normal blood volume is absolutely essential in these cases and should be done without delay. Small transfusions of fresh blood are very necessary in cases of acute pancreatitis.

5. The relief of pain is an urgent problem. Large doses of opiates are frequently given. Morphia will certainly relieve the pain but will produce a spasm of the sphincter of oddi; hence it is not administered by some surgeons.

With a view to reduce pancreatic secretion atropine or banthine may be used. Pain has also been relieved by blocking the sympathetic nerves with procaine. In some cases, a paravertebral block or a continuous epidural procaine block is given to relieve pain.

. 6 Hypocalcaemia also occurs and this can be detected by finding out the serum calcium. Calcium gluconate is given intravenously to correct this deficiency.

If the blood amylase is about 200 to 500 units, surgery may not be necessary and the treatment is symptomatic which includes gastric suction drainage, fluid and electrolyte therapy, paravertebral block to relieve pain and blood transfusion.

If the blood amylase is more than 1500 units, surgical drainage is indicated. The surgeon should confine his activities to the insertion of a drain into the lesser sac in the region of pancreatic involvement. If the patient has also got gall stones, a cholecystostomy or a *choledochostomy* is done.

Pre-operative instructions :—

1. Abdomen to be prepared.
2. Enema is given the previous night and on the morning of the operation.
3. Ryle's tube to be passed.
4. Blood, 500 c c, and 2 bottles of saline are kept ready in the operating room.

Post-operative care for these patients will be on the same lines as for a case of sub-total gastrectomy or a cholecystectomy.

The drainage tube must be left in situ till the discharge becomes very little. The *character of the discharge should* be analysed to find out if there is any bile or pancreatic enzymes. If it is a pancreatic fistula, then the loss of fluids and electrolytes is very great and requires replacement. A continuous suction is used to prevent any destructive action on the skin and surrounding tissues by the pancreatic enzymes.

In suspected cases of pancreatic cysts, the following investigations are done :—

1. Serum diastase and urinary diastase.
2. Fasting blood sugar.
3. X-ray examination of abdomen after giving a Barium meal.

Pancreatic cysts produce a smooth indentation on any hollow viscera which they displace. The cysts sometimes

displace a hollow viscus without producing any obstruction. Cysts of the pancreas arising in the tail may displace the

(a)

Fig. 44(a) Diagram showing the Duodenal loop widened in cases of tumour or cyst of the pancreas

(b)

(c)

Fig. 44(b) Diagram showing stomach displaced downwards due to a Tumour above the lesser curvature

Fig. 44(c) Diagram showing displacement of stomach upwards due to a tumour or cyst of pancreas

left kidney or by compressing the renal artery and vein, may interfere with the excretion of radio-opaque substance by the kidney.

Pancreatic cysts may be treated by :—

1. Marsupilisation.
2. Simple drainage.
3. Internal drainage by anastomosis to the stomach, duodenum or jejunum.
4. Excision of the cyst.
5. Pancreatectomy or pancreato-duodenectomy.

In cases where marsupilisation or simple drainage is done, there is usually a certain amount of excoriation of the skin of the abdominal wall and profound loss of fluid, digestive ferment and electrolytes. Hence this procedure of simple drainage or marsupilisation is being replaced by *internal drainage. In patients who are desperately ill,* marsupilisation is the method of choice.

Pancreatectomy, Total and Partial

Pre-operative preparation for a case of total or partial pancreatectomy :—

Many of these patients have jaundice and have lost considerable weight. In addition, some of them have diabetes *mellitus and in the older age group, the cardio-vascular* system and the renal function may not be at its best. Before a pancreatico-duodenal resection is done, all efforts must be made to correct these deficiencies

1. Diet: These patients must be on a high carbohydrate, high protein, low fat and high calcium diet.

5% solution of glucose, 1000 c.c., is given intravenously daily. Plenty of vitamins are added to the diet.

2. Blood transfusion is necessary to improve the general health and raise the *Haemoglobin percentage to a safe* operative level.

3. Most of these patients have diabetes and their diet must be controlled and insulin administered.

4. Antibiotics and chemotherapeutic drugs are given to control any infection.

5. Vitamin K is usually administered intramuscularly to correct the prothrombin deficiency.

6. Replacement of deficient Pancreatic enzymes.—Pancreatin (U.S.P.) 0·32 gm. or 5 gr. in enteric coated tablets one to three tablets thrice a day after food.

Post-operative care:

1. Fluid and electrolyte balance: Appropriate quantities of glucose and saline should be given intravenously to maintain the patient's nutrition.

Fluid balance charts are kept and the intake and output recorded very carefully.

2. Antibiotic therapy, penicillin and streptomycin are administered daily for 5 days after operation.

3. Vitamin K is administered intravenously or intramuscularly every other day until the risk of haemorrhage is passed.

4 In cases of sub-total or total pancreatectomy, the blood sugar must be estimated at regular intervals and the urine examined for sugar and acetone.

5. Post-operative ileus: This is effectively controlled or prevented by gastric decompression using a suction syphonage of the Wangenstein's type. This decompression is done for 4 or 5 days or until the patient passes flatus.

Some of the complications met with after the operation of partial or total pancreatectomy are as follows:—

1. Liver failure,
2. Post-operative haemorrhage,
3. Wound infection and burst abdomen,
4. Pancreatic fistula after partial pancreatectomy.

Management of a pancreatic fistula:—

This is treated by a continuous suction. A rubber catheter is passed through the fistulous opening and the catheter is connected to a suction apparatus. If the suction is carefully supervised, excoriation of the skin does not occur. If excoriation occurs, aluminium paste or amphojel is applied over the area. To reduce the pancreatic secretion in these cases, drugs like atropine, ephedrine and banthine are given. Ephedrine 3/4 grain causes a considerable diminution in the amount of juice excreted by the pancreas. In these cases of pancreatic fistula, the fluid balance must be carefully maintained.

Hyperinsulinism and Islet Cell Adenomas

Among the lesions that may give rise to hyperinsulinism, the following may be mentioned:—

1. Islet cell adenomas,
2. Islet cell carcinoma,
3. Hyperplasia of the islet cells.

The usual investigations mentioned for pancreatic lesions earlier should be carried out:—

The diagnosis of this condition is by doing a fasting blood sugar. If the blood sugar value is below 50 mgms per 100 c.c., the possibility of an islet cell tumour must be borne in mind. This condition of hypoglycaemia can also occur in other conditions like disorders of the pituitary or adrenal glands. This can be excluded by taking Roentgenograms of the skull and doing adrenal function tests such as the water test of Kepler and the two tests proposed by Craine and Thorn.

The two tests are: (1) An injection of Epinephrine is given to find out the eosinophilic response in the patient. The epinephrine stimulates the pituitary to secrete ACTH which depresses the Eosinophil count. If a normal fall of 50% in circulating eosinophils occurs, serious disease of the pituitary or adrenal cortex may be eliminated.

The second test consists of injecting ACTH directly and measuring the eosinophils. A similar depression indicates an intact adrenal cortex.

These patients with hyperinsulinism show signs and symptoms of hypoglycaemia and an exploration of the pancreas is justified:

(i) if the blood sugar value during an attack or after 12 hours of fasting is below 50 mgms. per 100 c.c.

(ii) if the symptoms are relieved by oral or intravenous administration of sugar.

(iii) if the attacks come on during periods of fasting or after extreme exertion. (Whipple's Triad).

The operative procedures that have been done for these cases are:—

1. Enucleation is the treatment of choice when a circumscribed adenoma is found.

2. Distal pancreatectomy when the adenoma is localised in the tail of the gland.

3 Sub-total pancreatectomy and, in some cases, total pancreatectomy have been done for cases of hyperinsulinism.

Just before the operation, 5% glucose should be administered intravenously and this is continued during the operation also.

Post-operative management:

In all patients in whom an islet cell adenoma has been removed, a mild degree of hypoglycaemia occurs which lasts for about 10-14 days. In some cases, insulin may be necessary to control the diabetes. A pancreatic fistula may occur and this is treated by constant suction. This fistula usually closes after a few days. The rest of the post-operative treatment is similar to a case of sub-total gastrectomy or any major abdominal operation.

CHAPTER 19

SURGERY OF THE ADRENAL GLAND

This decade's most fashionable endocrine gland is the adrenal and it has attracted the attention of surgeons in an ever increasing measure. During the last 30 years, remarkable advances have been made in our knowledge of the normal and abnormal adrenal gland.

The following are the indications for surgery on the adrenal gland: —

1. Tumours of the adrenal cortex without endocrine symptoms.

2. Tumours of the adrenal cortex with endocrine symptoms.

   (a) Cushing's syndrome.

   (b) Androgen effects.

   (c) Oestrogenic effects.

3. Hyperplasia of the adrenal cortex as in cases of adreno-genital syndrome and Cushing's syndrome.

4. (a) Tumours of the medulla without endocrine symptoms.

   (b) Pheochromocytomas.

5. Carcinoma of the prostate and breast.

6. Hypertension.

7. Addison's disease.

Bilateral adrenalectomy is done in: —

1. Selected cases of malignant hypertension,
2. Cushing's syndrome,
3. Late or disseminated cases of cancer.

This operation has been tried in various conditions like uterine cancer, cancer of colon, ovaries, malignant melanoma, acute myelogenous leukaemias and in leiomyosarcoma of the

uterus. The operation has not proved of value to date. Only in the hormone dependent cases of cancer of breast and prostate has adrenalectomy been shown to control the disease, in a proportion of cases and to a marked regression of the tumour in a few others.

Adrenalectomy is an extension of the surgical method of altering the hormonal environment of the patient, by removing the extragonodal source of androgens and oestrogens which might well be responsible for the failure of hormonal treatment or the reactivation of the neoplasm following castration. To-day, bilateral adrenalectomy is done in cases of breast cancer with (a) multiple skeletal metastasis, (b) wide-spread cutaneous lesions, (c) in visceral metastasis, hepatic, peritoneal, cerebral and in selected cases of pulmonary and pleural metastasis.

In prostatic cancers, adrenalectomy is indicated when the beneficial effect of orchidectomy, oestrogens and radiotherapy is no longer controlling the disease and wide-spread skeletal lesions are already present.

Pre-operative Management. A detailed history and pre-operative investigations are absolutely necessary before submitting the patient for operation.

1. History and complete clinical examination, noting the extent and distribution of the growth;
2. General health of the patient;
3. Laboratory studies like
    - (i) R.B.C., W.B.C., Differential count and platelet count;
    - (ii) Hb %,
    - (iii) Blood grouping;
    - (iv) Complete urine examination;
    - (v) Serum sodium (Serum sodium rises in Cushing's syndrome);
    - (vi) Serum potassium (Serum potassium falls in *Cushing's syndrome*);
    - (vii) Calcium;

(viii) Serum chlorides;

(ix) Serum phosphorus;

(x) CO_2 combining power of blood;

(xi) Serum acid and alkaline phosphatase;

(xii) N.P.N.

(xiii) Blood sugar estimation.

4. X-ray of the long bones, pelvis, skull and spine to show whether there is any metastasis or demineralisation of bones, which occurs in Cushing's syndrome.

5. I.V.P. (which is altered if there is a large adrenal tumour or it may show a downward displacement of the kidney due to the tumour).

6. Peri-renal insufflation of air reveals outline of the kidney and the presence of any tumour of the adrenal.

7. Aortogram.

8. X-ray of the lungs;

9. Examination of all the other systems particularly to find out in cases of cancer, whether there are any metastases in the liver, ovaries, lung or brain.

10. Estimation of urinary 17 Ketosteroids is of great importance in patients submitted to adrenalectomy. Excretion of neutral 17 Ketosteroids is highest in cases of adrenal carcinoma and moderately elevated in adrenal cortical hyperplasia. Following adrenalectomy, there is invariably a fall of 17 Ketosteroids and administration of androgens results in a rise

11 Estimation of oestrogens in the urine. (High oestrogen excretion is observed in cases of cortical carcinoma).

12 Thorn test. This test is very specific and reliable. An intramuscular injection of 25 mgms of ACTH is given and the percentage of fall of eosinophils in the circulating blood is calculated. If there is no fall in the eosinophil count, it signifies complete cortical absence or insufficiency. A fall in the count after bilateral adrenalectomy indicates an incomplete removal or the presence of accessory adrenals.

Another test introduced by Thorn is to find out the uric acid—creatine ratio. Following an intramuscular injection of ACTH, there is an increase.

The pre-operative investigations in cases of adrenal medullary tumour are:—

1. B.M.R. which is elevated in some cases.

2. Blood sugar during the attacks is often but not always found to be abnormally high.

3. Specific diagnostic test like (a) Histamine test:— This test is done as follows—Patient should not have any sedation for 12 hours or Thiocyanate for 4—6 days. Intravenous injections of small amounts of Histamine 0.025 to 0.05 mgm leads to precipitous rise in B.P. accompanied by characteristic symptoms of paroxysmal attack including circum-oral pallor, pilo-erection and sweating. There is practically no rise in B.P. in normal and hypertensive individuals. This test is therefore an indirect epinephrine test, the Histamine leading to an output of epinephrine from the adrenal medulla or from the adrenal medullary tumour, the latter yielding a greater output and consequently a greater pressor response. Some workers have noted a rise of 200 m.m. systolic and 150 m.m. diastolic in their cases after Histamine injection. Some have pointed out that there is a possibility of a fatal cerebro-vascular or cardiac accident during the test; but others have shown that the risk is no greater than when the paroxysms occur spontaneously. This test is of course not applicable in cases of Pheochromocytoma with sustained hypertension.

(b) Benzo dioxane test. This test is of value in the diagnosis of patients with sustained rather than paroxysmal hypertension because in cases of Pheochromocytomas, it causes a marked fall of B.P. Following an intravenous injection of Benzo-dioxane (10 mgm per sq. metre of body surface given in a 1 or 2 % solution), the B.P. has been found to drop significantly in cases of Pheochromocytomas but not in other types of hypertension. Dibenamine is another drug

which has been used and this also produces a fall of B.P. but does not produce any alarming hypotensive reactions in patients who do not have pheochromocytoma.

(c) Regitine test. This seems to be a more reliable test and lowers B.P. in patients with pheochromocytomas and produces no change in patients with essential hypertension.

(d) Tetra-ethyl-ammonium test: 400 mgms of Tetra-ethyl-ammonium bromide given intravenously is followed by a precipitous rise in B.P. in cases of Pheochromocytomas whereas patients with other types of hypertension as well as normo-tensive individuals respond with a fall of B.P.

(e) Estimation of Noradrenaline in the patient's urine The most reliable diagnostic test is the estimation of the amount of adrenaline and noradrenaline in the patient's urine The normal is about 70 micrograms per day. In patients with pheochromocytoma, the level varies between 400 and 4000 micrograms per day even when the urine has been collected between attacks.

In addition to these tests, all the laboratory studies mentioned above should be done—I.V P., peri-renal insufflation of air, laminography and aortography are helpful in diagnosis.

The pre-operative preparation of these patients consists in:—

(a) Improving the Hb percentage to the safe operative level;

(b) Cortisone administration starting 2 days before operation, 100 mgms i.m. daily; 100 mgms i.m. at the time of operation; during the operation, the patient is given 5 % dextrose in water or blood or both if necessary. If there is a fall in B P., Noradrenaline is added to the 5 % dextrose in water and the rate is adjusted depending on the status of the patient. As soon as the B.P. returns to normal, Noradrenaline administration is stopped. In cases of medullary tumours, like Pheochromocytomas, manipulations of the tumour may

precipitate an attack of hypertension and after removal, a serious fall of B.P. This is tackled as follows: —

(a) Intramuscular injection of 5 c.c. Lipo adrenal extract is given in the morning before operation.

(b) Intramuscular injection of 5 c.c. of Desoxycorticosterone is given on the morning of the operation.

(c) Intramuscular or intravenous injection of Regitine is given before anaesthesia in doses sufficient to control hypertension as determined pre-operatively. Usually 2½—5 mgms of Regitine is given intravenously an hour or two before operation, then in dosage of 0.05 to 0.35 gm per Kgm. body weight during the operation to prevent paroxysms of hypertension and tachycardia. An intravenous drip of 5% dextrose in water should be running throughout the operation. The Noradrenaline solution, containing 5 mgm in 500 c.c. of normal saline, is started as soon as the B.P. falls and the rate of flow governed by the B.P. Blood should also be given during the operation to replace blood lost. After surgery, the Noradrenaline drip is maintained and the B.P. is taken every 5 minutes until it is stabilised. Sometimes it takes about 12 to 48 hours before the B.P. is stabilised. If there is adrenal deficiency after operation, 5 mgms of desoxycorticosterone is given intramuscularly daily, and 2 c.c. of Lipo-adrenal extract is given intramuscularly every 4 hours upto a total dosage of 10 c.c.

The patients are given antibiotics in the post-operative period and the other respiratory or abdominal complications must be attended to as in any other case of major abdominal operation.

The post-operative management after bilateral adrenalectomy is as follows:—

The patient is given cortisone acetate 100 mgms intra-muscularly every 6 hours for 24 hours. On the 2nd day, the dosage is reduced to 50 mgms every 6 hours. Usually, within 72 hours after operation, the amount of cortisone to be given is reduced and the intravenous administration of fluids

is stopped. Fluids are given by mouth and about 3—4 gms of salt are included in the diet. By about the 5th day, the amount of cortisone to be given is reduced to 60 to 75 mgms. In some cases, only 40 mgms daily is required and the average maintenance dose is calculated. If the amount of cortisone is not enough, the patient feels very weak, loss of weight, and gastro-intestinal disturbances develop. Thus the maintenance dose is calculated by noting the state of the patient, his appetite, weight and the sense of well-being.

Patients who have had bilateral adrenalectomy must be given a written pamphlet about the precautions they should take and what they should do in cases of emergency.

1. Cortisone tablets should be taken daily for the rest of the patient's life.

2. Normal diet with plenty of salt, 3 to 5 grams.

3. If the patient gets an attack of flu or infection, more cortisone should be taken. If a feeling of weakness is still present, then the amount of cortisone taken is not enough. When he consults a physician about his medical condition, he must inform at the outset about the operation performed and the amount of cortisone prescribed by the surgeon. If any operation is done, these patients should take cortisone in doses of 15 mgms every 4 or 6 hours for at least 24 hours before operation.

4. Another important instruction that is given to such a patient is—(a) He should have plenty of cortisone to meet any emergency, (b) salt tablets and a broad spectrum antibiotic should be kept in readiness to meet any emergency; (c) A detailed letter to the physician about the operation done and also a brief outline about the type of therapy in cases of crisis If the patient gets a crisis, 200 mgms of cortisone should be taken daily. Intravenous saline, Doca and antibiotics may have to be given to tide over the crisis. Salt depletion must be avoided by adding 3 grams or more of NaCl or Desoxycorticosterone acetate, 1 mg. per day for 3 to 6 days in the week. These instructions must be carried out by the patient constantly wherever he goes.

CHAPTER 20

UROLOGY

Pre-operative care in urology has been repeatedly emphasised during the past two decades and the increasing success met with, fully justifies all the care that has been bestowed on such patients. Sound pre-operative care consists in performing complete chemical and laboratory tests before the patient is subjected to surgery; and considerable improvement can be achieved by medical measures before surgery is instituted. Post-operative care of these patients has received less attention; yet it is of the utmost importance in urological cases.

It is now fully realised that the discharge of a patient from the hospital as cured, does not imply that further post-operative care is not needed. The patient should be seen repeatedly for a few years before one can say that he is completely cured. Continued observation and treatment will produce permanent improvement in the patient's condition which, without such continued interest, may result in failure or a temporary alleviation. The responsibility for organisation and the efficient working of a unit rests mainly with the assistants and the house surgeons of the unit concerned. They must see that every detail is completed before the patient is submitted to operation. Such requirements demand good co-operation between the house surgeons, assistants of the unit and the nursing staff as also the co-operation extended by other departments of the hospital. The first contact with the patient is by the house surgeon.

The house surgeon must secure a complete history and make a detailed physical examination of his patient. He is responsible for seeing that all the reports from the various departments are noted in the case sheet so that the work-up

of every case should be prompt and exact. All the necessary data must be up-to-date.

A. History.

B. Physical examination.

C. Routine examinations which must be done in every case.

1. Complete haematological examination —
   R.B.C.,
   W.B.C.,
   and Haemoglobin %
2. B.P. determination.
3. V.D.R.L. Test or Kahn and W R. tests for syphilis.
4. Complete urine examination —
   Culture,
   Two glass test,
   Residual urine.
5. Pheno-sulphopthaline test (P.S.P.)
6. Blood urea or N.P N. If it is high, it should be repeated every other day until it is normal or otherwise ordered.
7. Blood chemistry check-up:
   Blood chlorides,
   CO_2 combining power of blood,
   Blood calcium,
   Blood phosphorus,
   Serum K,
   Serum sodium,
8. Examination of urethral discharge and prostatic smear.
9. Renal function tests like urea clearance and urea concentration tests.
10. X-rays:

1. Plain X-rays of abdomen for evidence of any calculi in the genito-urinary tract and in suspected cases of

malignant disease of the urinary tract, X-ray of the spine, pelvis, skull and lungs for any evidence of secondaries.

2. Intravenous pyelography, to demonstrate the size, position, state of rotation and function of either kidney.
3. Special investigations like cystoscopy and chromocystoscopy and passing of ureteric catheters into both the ureters for collection of samples of urine from each kidney; Retrograde pyelogram may be done if necessary. A complete chemical, bacteriological and microscopic examination of the urine from each kidney is done

11 Lumbar aortography.

12. Perirenal pneumogram. This procedure has a definite place in diagnosis of adrenal, renal, perirenal, retroperitoneal and perivesical diseases It is accurate and safe and, in conjunction with trans-lumbar aortography, enables detailed study of perirenal structures

Surgery sooner than 48 hours after an intravenous or a retrograde bilateral pyelogram is to be discouraged except as an emergency when the patient has developed renal anuria or suppression

Preparation of the patient:

The intake of fluids should be about 5-7 pints a day for several days before operation. A normal intake of food is also necessary and smooth working of the gastro-intestinal tract with a careful observation by the house surgeon noting the intake and output of the patient plays a great part in the smooth convalescence after operation.

The **pre-operative** preparation consists in:—

1. Blood grouping and having at least 2 to 3 pints of blood for cases of nephrectomy or cystectomy or prostatectomy.

2. Correction of electrolyte imbalance and anaemia, if necessary.

3. Preparation of operative field consists in shaving the abdomen and the flanks.

4. Pre-operative sedation consists in giving a sedative like phenobarbitone gr. 1½ to 2 at bed time.

5. Soap and water enema in the night just before going to bed and one in the morning a couple of hours before operation.

6. Morphia and atropine should be given to the patient only after consulting the anaesthetist.

7. Patient is starved from midnight but can be given a cup of coffee at 5 A.M. in the morning after consulting the anaesthetist.

8. If the patient has any urinary infection, he is given antibiotics or chemotherapeutic drugs before operation.

Post-operative care:

After the patient returns to the post-operative ward, the following details should be attended to by the house surgeon and nurse concerned.

1. *Position of patient in bed.* The patient should be on his back with the foot of the bed raised for 8 hours, only if the operation was performed under spinal; otherwise, he should lie on his back or on the side of the operation to facilitate drainage, especially in nephrectomy or nephrolithotomy cases.

2. *Post-operative shock.* This is treated by giving him a blood transfusion and if his blood pressure has returned to the normal level, the transfusion is continued with 5% glucose in water. A total of 1500 c.c. of 5% glucose in water is given for these patients within 24 hours.

Blood pressure and pulse are taken and charted every hour until stabilised and then twice daily for three days.

3. *Intake and output chart* should be maintained. A slight excess of fluid intake over the loss of fluids from the body is necessary to maintain the renal output.

4. *Nothing is given by mouth* until peristalsis is adequately established. During this period, patient gets intravenous fluids in the form of glucose or glucose saline.

5. *Post-operative sleep.* For the first 24 to 48 hours, morphia is given to relieve the pain and induce sleep. Later he may be given any one of the barbiturate preparations at bed time to give him sleep for 6 to 8 hours. In children, sedation is usually not required. If it is necessary, small doses of phenobarbitone, according to age and weight, is given.

6. *Post-operative diet*: After peristalsis has been established and the patient passes flatus, liquid diet is started. On the 4th or 5th day after operation, semi-solid diet is given and normal diet on the 10th or 11th day. In cases where the kidney is damaged, protein foods should be given sparingly.

7. *Dressings.* The dressing should be changed frequently to prevent excoriation or soddening of the skin. When the drainage tube is being shortened, it must be prevented from slipping inside by passing a large size safety pin through the tube The dressing should be inspected twice a day on the first day of operation to see if there is any haemorrhage and may be changed if necessary. If there is no discharge, the drainage tube can be completely removed on the 2nd or 3rd day. Skin sutures are removed on the 12th day.

Some of the complications that are met after operations on the kidney are as follows:

I. Post-operative abdominal distension:

This can be tackled by the following methods:—

(a) leaving an indwelling Ryle's tube in the stomach and instituting a Wangenstein's suction syphonage;

(b) nothing by mouth until patient passes flatus;

(c) passing a flatus tube to relieve the distension;

(d) Turpentine stupes to the abdomen;

(e) Calcium pantotheonate injections are given every six hours intramuscularly till the distension is relieved.

(f) Some surgeons advocate Prostigmine injections 0·5 mg. intramuscularly every 6 or 8 hours. Usually, the above measures are effective and Prostigmine injections are not necessary.

II. Post-operative atelectasis:

This complication should be suspected if there is a sudden increase in the respiratory rate. It is treated by the following measures:—

(a) Oxygen should be administered for respiratory distress and cyanosis.

(b) Deep breathing exercises should be encouraged to prevent this post-operative complication.

(c) Stimulate cough, by tapping the chest and tracheal suction with catheter.

(d) Bronchoscopy and aspiration of any plug of mucous that is responsible for collapse of the lung.

(e) Antibiotics are administered to avoid abscess of the lung and pneumonitis.

III. Post-operative retention of urine can be prevented by:

(a) applying hot fomentations to the suprapubic region;

(b) propping up the patient and thus changing his position so as to help him to pass urine;

(c) Carbachol tablets may be given, one tablet twice a day to overcome the retention.

(d) if these measures fail, catheterisation may be necessary.

This complication is usually overcome in about 24 to 48 hours.

IV. Post-operative hiccoughs may occur in some cases of Nephrectomy or Nephrolithotomy or Prostatectomy. This is treated by:

1. checking on the blood urea of the patient and correcting it
2. giving CO_2 inhalations.
3. giving Morphia with Atropine.

V. Haemorrhage. Severe bleeding may occur if the ligature slips off the renal pedicle after Nephrectomy. In these cases, the wound has to be reopened and the bleeding vessels caught and tied. Sometimes, bleeding may occur after a Nephrolithotomy. This can also be controlled by the usual measures like packing the wound firmly with gauze or gel foam. If the bleeding cannot be controlled, a Nephrectomy may have to be done.

VI. Infection of the wound. This is ably controlled by chemotherapeutic or antibiotic drugs The drainage tube should not be removed till the discharge from the bed of the kidney ceases. If it is removed early, blood and urine might collect and may give rise to severe infection and toxic absorption. In these cases, the wound may have to be opened and the drainage tube reinserted.

VII. Anuria. This may occur after operations on the kidney, ureter or bladder. This complication can be controlled or prevented if the pre-operative treatment has been good.

If the patient develops anuria or uraemia, he is given the "Modified Borst" diet. This diet consists of an emulsion of the following constituents:

Glucose 400 gms.
Peanut or olive oil 100 gms.
Acacia (to emulsify),
Water 1 litre,
Vitamin B complex and Vitamin C.

Ryle's tube is passed into the stomach and the emulsion is given as an intragastric drip both day and night. The patient is given 1000 c.c. in 24 hours. If he vomits, this is collected, filtered and reintroduced through the Ryle's tube. When the patient starts passing urine, the blood chemistry and urine chemistry should be determined. Large amounts of Sodium, Potassium and Chlorides are passed in the urine daily and hence the blood chemistry should be determined in every case. The amount of urine passed is noted and an equal amount of fluid should be given by an intragastric drip, half of it in the form of normal saline and the rest being the emulsion stated above. When the output has reached about 40 ozs., the patient is given a high caloric but low protein diet. When the uraemia or anuria has passed off, the patient can be put on a normal diet.

VIII. Post-operative urinary fistula. This is a complication that is likely to occur after operations on the kidney or the ureter Usually, it ceases if there is no obstruction to the onward passage of urine. The surgeon should always check on the patency of the ureter after an operation of Nephro- or Pyelo-lithotomy by passing a catheter down the ureter into the bladder to prevent post-operative urinary fistula.

Indications for Nephrectomy

Nephrectomy is the operation of choice for stones associated with gross kidney damage, pyonephrosis and hydronephrosis, provided that the other kidney is healthy and likely to remain so. Nephrectomy is also done in cases of tuberculosis of the kidney. Neoplasms requiring nephrectomy are: Malignant tumours like hypernephroma of the kidney and renal embryoma or Wilm's tumour occurring in children. In some cases like angioma or papilloma of the kidney, nephrectomy may have to be done to control the severe bleeding

Renal embryoma

The history, physical finding of the abdominal mass, x-ray examination of skull, lungs and long bones, excretory urogram, retrograde pyelogram, if necessary, and urine examination should be done as a routine. In cases of doubt about the origin of the mass, barium meal and barium enema pictures are also taken. The renal function tests and blood urea are done before operation.

Pre-operative preparation:

If anaemia is present, pre-operative transfusion is indicated. These children should be operated as early as possible because repeated palpation of the tumour by students and doctors increases the risk of tumour cells passing into the blood stream, hence the sooner the tumour is removed the better are the chances of cure. These tumours are radio-sensitive and some surgeons give pre-operative irradiation—(a) to reduce the size of the tumour, and (b) to kill off the malignant cells and prevent their escape into the blood stream during the manipulations of the operation.

The most important disadvantage of pre-operative irradiation is that it puts off the operation for several weeks and thereby allows time for metastasis to occur through the blood stream Hence immediate surgery followed by post-operative irradiation has been advocated by most urologists. In some clinics, the first dose of X-ray therapy is given on the day of the operation before the child recovers from anaesthesia. The healing of the wound is not interfered with by the immediate post-operative X-ray therapy.

Post-operative care:

The usual treatment after nephrectomy is carried out and the child is seen every three months for two years. X-ray of the lungs and bones should be taken regularly to find out if there is any metastasis.

Malignant tumours: Hypernephroma or adenocarcinoma

The routine investigations should be done before submitting the patient to surgery. The general health of these patients must be improved so that the patient may be in the best possible condition for operation. Anaemia, infection, dehydration, malnutrition and other associated diseases like diabetes, pulmonary complications and heart disease all add to the hazard of the operation and must be treated before surgery.

Renal tuberculosis

The history and, physical examination may help us to diagnose the condition. Laboratory examination may show:

(a) Sterile acid pyuria,

(b) Tuberculous bacilluria,

(c) Haematuria,

(d) Cystoscopy may show ulceration, inflammation, tubercle formation in the bladder or golf hole ureteric orifice in advanced cases of renal tuberculosis.

(e) Catheterisation of urine specimens from each kidney to be done for culture, guinea pig inoculation and for staining centrifuged sediment for tubercle bacilli.

(f) Retrograde pyelography to demonstrate the exact extent of kidney damage. This helps the surgeon to decide whether nephrectomy or hemi-nephrectomy is to be done.

(g) Careful investigations should be done to find out whether tuberculous foci is present elsewhere in the body, especially in the lungs and in the opposite kidney.

Pre-operative treatment consists in:—

(a) Improving the general health of the patient;

(b) Anti-tuberculous drugs like Streptomycin ½ to 1 gram intramuscularly daily in adults and ¼ to ½ gram in children twice or thrice a week for 3 to 4 months.

Paraaminosalicylic acid in divided doses daily by mouth (10 to 12 grams in adults and 0 1 to 0·2 gram/Kilogram in children). Isoniazid, 4 to 7 mg/Kilogram in divided doses daily by mouth for children and about 200 to 300 mgms daily for adults.

Post-operative management:

(a) Same as mentioned under nephrectomy.

(b) Streptomycin, P.A.S. and Isoniazid must be continued for 1 to 1½ years; Streptomycin therapy being interrupted for short periods of a month or two when P.A S. and Isoniazid are being continued

Complications:

(a) Wound infection. This is rare after the advent of Streptomycin therapy.

(b) Tuberculous fistula. This is likely to occur if the stump of the ureter left behind is also diseased. Complete removal of all diseased tissue must be done to prevent this complication.

(c) Vesical ulceration may still remain, if the ureteral stump of the bladder is badly diseased. Intensive Anti-tuberculous treatment may help to eradicate the disease.

(d) Vesical contracture. This is likely to occur if the bladder has been involved by the tuberculous focus. In such cases, cutaneous ureterostomy is done if the urine culture is positive for tubercle bacilli. If culture is negative, uretero-sigmoidostomy is done.

Renal Injuries

Injury to the kidney usually occurs as a result of gun shot wounds or penetrating wounds like knife injuries. The patient usually gives a history of trauma and severe pain in the abdomen. In addition to kidney injury, there may be damage to the other viscera either in the abdomen or in the chest. On examination, patient is severely shocked and may

have haematuria. Sometimes, there may be a palpable mass on the affected side. When there is an associated damage to the abdominal viscera, the patient may have the peritoneal irritation which may be diagnosed by the tenderness, guarding and rigidity in the later stages.

The immediate investigations that should be done are:

(a) Haemoglobin percentage;

(b) Urine examination.

In cases of doubt, an intravenous pyelogram and cystoscopy is necessary. This condition of injury to the kidney must be differentiated from a ruptured spleen, liver or bowel.

Pre-operative care consists in:

(a) Treating shock by blood transfusion or plasma transfusion;

(b) Antibiotics;

(c) Nothing by mouth;

(d) Blood pressure taken every ½ hour to note the degree of shock;

(e) Consultation with the anaesthetist as regards pre-operative medication.

If the kidney had been badly injured, nephrectomy may have to be done after verifying the presence and function of the opposite kidney by intravenous pyelogram. Uncomplicated minor injuries of the kidney which comprise the majority, usually recover under expectant treatment without operation. The prognosis of renal injury depends on the extent of the injury and on how promptly surgery is instituted.

Renal injuries associated with extensive trauma to the abdominal viscera are usually fatal.

Post-operative management:

The great majority of renal injuries may be treated by supportive measures and watchful waiting. If nephrectomy has been done, then the post-operative orders should be as mentioned under nephrectomy.

Nephrolithotomy

This operation is done for cases of calculi in the renal parenchyma.

Preliminary investigations: Certain information must be in the possession of the surgeon before he embarks on the operation of Nephrolithotomy. A complete history is taken and an urological examination should be done. In addition, the following investigations are carried out: —

(1) Plain X-ray of kidney, ureter and bladder to find out the size, shape and position of the stone in the pelvis or calices of the kidney.

(2) Intravenous pyelogram to find out the functional efficiency of both kidneys.

(3) Retrograde pyelogram and accurate localisation of the calculus in relation to the pelvis and calices must be done before operation.

Just before operation, a plain X-ray sholud be taken to locate the exact situation of the calculi.

(4) Cystoscopic examination to find out the presence of stones or growths in the bladder and to observe the efflux from the affected kidney.

(5) Chromocystoscopy to find out the functional efficiency of each kidney.

(6) Renal function tests should be done before operation.

(7) Blood chemistry is done as a routine in cases of renal lithiasis. If the serum calcium is above 11 mgm./100

c.c. and serum phosphorus below 2·5 mgm./100 c.c., one should suspect hyperparathyroidism. After removal of the stone, the composition of it is determined and if it contains pure calcium phosphate, the diagnosis of hyperparathyroidism is no longer in doubt. In these cases, removal of the stone alone will not cure the condition and a recurrence is likely to occur until the parathyroid tumour is removed.

Laboratory examination consists in doing:

(a) Urine examination;

(b) Urine culture;

(c) Non-protein nitrogen;

(d) Blood calcium, phosphorus and phosphatase;

(e) Serum proteins;

(f) Sulkowitch's test for hyper-calciuria.

In addition to these investigations, a complete radiographic survey for osteitis fibrosa cystica should also be done.

Patients with renal calculi must be differentiated from:—

(a) calcified mesenteric lymph glands;

(b) cholelithiasis;

(c) Artefact shadows (e.g., enteric coated tablets and foreign bodies).

The operation of Nephrolithotomy is done in cases which have a large branched calculus, but have not destroyed the renal function.

It is also done in cases where the calculus is present in a single functioning kidney.

In the pre-operative period, the intake and output chart is carefully recorded and the amount of urine passed in 24 hours is noted so that it can be a useful guide to the surgeon in the post-operative treatment of these cases,

Post-operative care:

As soon as the patient returns to the post-operative ward, the following instructions are given to the nurse in charge:

(1) Position of the patient. The patient should be placed flat on his back and a constant watch should be kept on the pulse and respiratory rate. After a day or two, the patient can be allowed to sit in bed and assume a position that will relieve all tension at the suture line.

(2) Post-operative pain is relieved by Morphia and this is given as soon as the patient has recovered from the anaesthetic. Morphia may be repeated in small doses every 6 or 8 hours.

(3) Post-operative shock is prevented by giving blood transfusion and following it by plasma substitute or glucose saline.

(4) Post-operative fluids. After the patient has recovered from anaesthesia, he is given small sips of water and later larger quantities depending upon the degree of post-operative vomiting or nausea. If he is not able to retain anything, the fluids are given intravenously either in the form of glucose saline or glucose in distilled water. High fluid intake always reduces concentration of urinary crystalloids. The diet after removal of the stone must be either alkaline or acid ash depending upon the composition of the stone. A well balanced diet with high Vitamin content excluding D Vitamin is prescribed in the post-operative period.

(5) Drugs. The patient is put on antibiotics for 4 or 5 days until the temperature touches normal. Aureomycin or Terramycin is the drug of choice. Streptomycin and chemotherapeutic drugs are found to be the next best.

(6) Post-operative management of bowels. For the first 48 hours, no attempt should be made to bring about a bowel movement. Patient may have excessive gas formation after a Nephrectomy or Nephrolithotomy and this may be relieved by passing a flatus tube or in some cases, by giving

a small dose of Prostigmine or Calcium Pantothenate injection. An enema is given after 48 hours. Subsequent bowel movements can be encouraged by giving the patient mild laxatives or repeating the enema every other day.

(7) Drainage of the wound. The drainage tube is left in position, depending upon the amount of discharge and the tube is shortened from the 3rd day onwards and completely removed when the discharge ceases. In cases where a nephrostomy or a pyelostomy has been done after removal of the stone, the tube is connected to a bottle for drainage. In the post-operative period, gentle irrigation with 'M' solution is done to dissolve any small calculi that may be in the calices or pelvis of the kidney.

> (Solution 'M' contains Magnesium oxide 3.84 G. Citric Acid 32.35 G. and Anhydrous Sodium Carbonate 8.84 G. per litre of water.
>
> This is used to dissolve calcium phosphate and carbonate calculi which may have been left behind in the kidney).

If the stones are composed of urates or cystine, a weak solution of Sodium Bicarbonate is used.

(8) The sutures are removed on the 11th or 12th day.

The pre-operative and post-operative management for a case of Pyelolithotomy is similar to a case of Nephrolithotomy.

In these operations, the renal function must be carefully assessed in the post-operative period by having the blood urea done every 3rd day and noting the amount of urine passed in 24 hours. Suppression of urine occasionally occurs and must be energetically treated by fluids and diuretics.

Plastic operations on the kidney may have to be done in cases of Hydronephrosis. All the above mentioned investigations should be done. The patient must have an intravenous and retrograde pyelography done to determine the size, shape and function of each kidney and the degree of contractility of the pelvis of the kidney on the diseased side.

A pre-operative umbrella of antibiotics must be given to control all infection.

Post-operatively, the treatment is the same as mentioned in a case of Nephrectomy or Nephrolithotomy.

Drainage of the kidney following plastic operations is essential for satisfactory results. The renal function is not disturbed and the suture line is prevented from giving way either from increased tension due to accumulating urine or from infection. The ureteral splint which is kept after a pelvi-ureteral anastomosis is allowed to remain for approximately 21 days. This catheter splint keeps the upper portion of the ureter in proper alignment and should be removed only after consulting the surgeon.

A radio opaque dye is injected into the nephrostomy tube to show the size of the pelvis and the patency of the new pelvi-ureteral junction. If the details as shown by the antegrade pyelography are good, the nephrostomy tube is removed 3 to 4 days after removal of the ureteral splint.

Gross infection may occur in some cases and may produce stricture formation at the site of the pelvi-ureteral anastomosis. When such a complication occurs, nephrectomy may be necessary.

Persistent urinary fistula may be due to obstruction low down and may have to be corrected by operation.

Follow-up of these patients is very necessary and this consists in doing :—

(a) Urine examination and urine culture every three months until the urine is sterile without the administration of any of the urinary antiseptics

(b) Intravenous pyelography to show the size and function of the kidney.

Any of the complications described under Nephrectomy or Nephrolithotomy may also occur after this operation and should be treated on the same lines.

Nephrostomy

Nephrostomy is done for the following conditions:

(1) as an emergency procedure in cases of anuria;

(2) to drain the kidney after a plastic operation on it;

(3) to provide permanent drainage when the ureter can no longer function.

(4) as a preliminary to Nephrectomy in cases of infected Hydronephrosis or Pyonephrosis.

(5) in surgical trauma of the ureter which may occur in certain types of gynaecological operations, so as to preserve renal function until subsequent repair or transplantation can be carried out.

The pre-operative instructions are the same as for an operation of Nephrectomy or Nephrolithotomy.

The post-operative care consists in connecting the Nephrostomy tube to a bottle. The amount of urine drained from each kidney is carefully recorded. Intake and output chart should be maintained. Intravenous fluids are continued until adequate output can be maintained by oral fluids. The Nephrostomy tube is changed once a fortnight. If there is any blocking of the tube, it is gently irrigated with aqueous Acriflavine solution 1 in 10,000 or sterile water or saline. When ambulatory, the nephrostomy tube is attached to a plastic urinal strapped to the thigh and is changed once in two or three months to prevent incrustation of drainage tube and calculus formation.

During the post-operative period, the renal function must be carefully checked up and the patient's water and electrolyte imbalance must be watched to prevent any complications like uraemia. Urine culture, blood chemistry determinations and intravenous pyelograms are done to determine the degree of renal rehabilitation.

Sometimes, the nephrostomy tube might slip out accidentally. When such a thing happens, the tube must be immediately replaced as the fistula may close in a few hours.

Infection in the post-operative period is prevented by prophylactic antibiotics and the care bestowed in keeping the tube clean by gentle irrigations.

Pre-operative and post-operative care for operations done on the ureter.

The surgical procedures on the ureter are:

(a) Uretero-lithotomy,

(b) Cutaneous ureterostomy,

(c) Uretero-intestinal anastomosis or transplantation of ureters.

Uretero-lithotomy is indicated for removal of a stone which has been impacted or lodged in either the upper, middle or lower portion of the ureter.

The investigations and the management of these patients are similar to those for an operation on the kidney and the pre-operative and post-operative treatment is practically on the same lines.

If after instrumental dilation of the ureter with catheter or bougies, the stone remains in the same position and evidence of back pressure on the kidney is noted, the operation of uretero-lithotomy is indicated. If the stone is irregular in shape and larger than 1 c.m. in diameter, one should not wait even if there is a possibility of the stone passing down after repeated attacks of colic. In cases where the patient is intolerant to cystoscopic manipulation and has developed B. coli infection, the chances of removal by the instrumental method is remote and uretero-lithotomy is indicated.

Where the stone is small in size, all conservative measures should be adopted like:—

(1) administration of diuretics,

(2) anti-spasmodics like Trasentin 6H or Neuro-trasentin, and

(3) in some cases, by instrumental manipulation using increasing sizes of ureteric catheters to dilate the ureter and by injecting lubricants like olive oil or liquid paraffin.

During this period of conservative treatment, radiographic examination at fortnightly intervals should be done and the position of the stone checked up. Even after the patient has had severe attacks of renal colic, if the stone remains in the same position for more than 2 months and evidence of renal damage is noted, the conservative treatment has to be abandoned in favour of an operation.

Before the operation, the following investigations are done:

(a) Urine examination and urine culture;

(b) Excretory urogram;

(c) Retrograde uretero-pyelography to demonstrate the degree of damage to the kidney, calices and pelvis.

(d) Cystoscopy and passage of ureteric catheters of increasing sizes to note the size of the ureter.

Antibiotics are given to control the urinary infection; Pre-anaesthetic medication after consulting the anaesthetist. The blood is grouped and transfusion may have to be given before the operation.

A plain X-ray picture is taken just before the operation to help the surgeon to locate the exact position of the calculus.

The post-operative care of these cases will be as follows:

(a) Fluids by mouth are started after 24 to 48 hours, depending upon the amount of abdominal distension. If normal peristalsis has started, oral fluids are begun.

(b) Intravenous fluids are given, depending upon the blood chemistry of the patient.

(c) Intake and output chart is maintained.

(d) Blood loss during operation is corrected by transfusion.

(e) Antibiotics are given to control urinary infections.

(f) When the ureter has been intubated by a tube, it is connected to a bottle. This tube is removed after a fortnight.

(g) The rubber or penrose drains that are placed close to the kidney or ureter should be shortened gradually as the discharge becomes less and less. In the majority of cases, it takes about 3 weeks for the wound to heal. If the sinus does not close and if there is still leakage of urine, it means that the ureter has been obstructed by stones below the site of operation or a stricture has formed at the site where the stone has been impacted

Traumatic injuries to the ureter may not be recognised immediately, especially if only one ureter is involved In abdominal injuries, penetrating or otherwise, the possibility of damage to the urinary tract should be borne in mind. When there is a suspicion of such damage, it is wise to have an intravenous pyelogram done to rule out any injury to the kidney, ureter or bladder. If the intravenous pyelogram reveals extravasation of urine from the ureter, an immediate exploration and an end to end anastomosis of the ureter is done. A drain should be placed at the site of injury and is shortened as the discharge decreases. If the injury has been there for a long period, it is preferable to do a Nephrostomy and later do reconstruction of the ureter.

Urinary fistula may occur due to a failure of the anastomosis or from stricture at the site of anastomosis.

Cystoscopic dilation of the ureter may cure some of the cases. In the others, either a reanastomosis has to be done or a nephrectomy, if it is not possible.

Bladder

Cystoscopy. Cystoscopic examination is the most accurate method of making a diagnosis of pathological conditions in the bladder. Stones, diverticula, ulcers and tumours in the bladder can all be seen and the origin and characteristics of

each could be easily determined. In the case of enlargement of prostate, cystoscopic examination may help us to find out the degree of intravesical enlargement.

The types of cystoscopes that are used are: —

1. Examination Cystoscope,
2. Operating irrigation cystoscope,
3. A panendoscope,
4. For transurethral resections of the prostate or bladder neck, a McCarthy's or Nesbit's Resectoscope with a foroblique lens system is used.

The most widely used types are McCarthy's panendoscope and Brown Burger's or Swift Jolly's operating irrigation cystoscopes.

Sterilisation of cystoscopes:

These instruments are cleansed by rinsing them under running water. They are then immersed in an antiseptic lotion which may be:—

(a) 1 in 60 carbolic lotion,

(b) Oxycyanide of Mercury, 1 in 1000,

(c) Methylated spirit.

The instruments are left in any one of these lotions for about 15 to 20 minutes.

Another method of sterilisation is to use Formalin vapour. Formalin tablets may be placed in the cystoscopic cabinet and left for about 2 days. If the tablets are allowed to evaporate by heat, the sterilisation of these instruments can be done within half an hour. The tablets easily get evaporated when the temperature is between 40 and 50° C. All the connections and ureteric catheters can also be sterilised by this method. This method of sterilisation is more efficient and penetrating than immersing in antiseptic solutions. Some cystoscopes have been constructed which will stand boiling. The advantages of sterilisation by heat

are self-evident, particularly in an instrument where there are so many possibilities of septic material being retained after use. At present, boilable cystoscopes are available which equal in performance to the non-boilable types. Regardless of the type of sterilisation used, it is imperative that the cystoscope be thoroughly washed with sterile water before introduction.

Cystoscopic examination can be done under local, sacral, general or spinal anaesthesia. When it is being done in the out-patient department, local anaesthesia is the best. Novocain 2 % solution is used for anaesthetising the urethra. The composition of the local anaesthetic is as follows:

Sodium bicarbonte	0.15	
Sodium chloride	0 1	
Novocain	0.6	(Lawen)

This powder is dissolved in 30 c.c. of water to make it a 2 % novocain solution As soon as the solution is injected into the urethra, a penile clamp is applied for a few minutes. Anaesthesia begins from 4 to 5 minutes following injection, reaching its full intensity in 20 minutes. The duration of anaesthesia varies from 60 to 120 minutes.

The usual investigations are done which include:—

1 Urine examination,
2 Urine culture,
3. Blood urea, and
4. in some cases, urea clearance test.

Preparation of the patient: The patient must have: —

(1) An alkaline diuretic mixture for a couple of days before examination

(2) Chemotherapeutic or antibiotic drugs are given to combat any infection in the bladder and also to prevent ascending infection.

(3) Bowel preparation. This is done by giving the patient a soap and water enema the previous evening and

repeating it on the day of examination. Some surgeons give 1½ to 2 ounces of castor oil to the patients the previous day instead of an enema. This bowel preparation is very necessary if X-ray studies of the urinary tract are to be made.

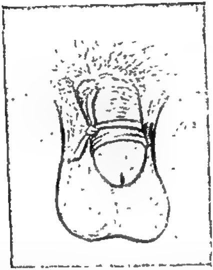


FIG. 45. Diagram showing the method adopted after injecting the Local anaesthetic into the urethra To prevent escape of the Local anaesthetic fluid a penile clamp or a tape is tied round the penis and kept in position for a few minutes.

(4) Morphia or any one of the barbiturates is given to keep the patient quiet during cystoscopy.

(5) The external genitalia should be shaved and washed with soap and water. The patient is then draped with sterile sheets across legs, thighs and abdomen.

(6) The external urinary meatus and anterior urethra are washed with sterile water before introducing the cystoscope in cases which are done under general or spinal. In cases which are done under local anaesthesia, the same preparation must be done before injecting the local anaesthetic drug.

In the female, the labia are separated with the fingers of the left hand and the anaesthetic solution gently instilled into the urethra. A pledget of cotton is placed over the lips of the meatus and gentle pressure applied for about five *minutes to prevent the anaesthetic solution escaping.* The introduction of the cystoscope may then be accompanied without pain or discomfort. General anaesthesia is always employed in infants and highly nervous individuals.

After examination, the post-operative treatment consists in :—

1. maintaining an intake and output chart;
2. watching for any lung complications;
3. rigor and fever; and
4. uraemia.

Antibiotics or chemotherapeutic drugs and alkaline diuretic mixture are given to control the infection.

In elderly patients, who have infection in the prostate or bladder and whose renal function is poor, cystoscopic examination should be done cautiously. In such cases, a preliminary catheterisation is done to test the "temper of the urethra" and the tolerance of the patient.

Contra-indications for cystoscopy are :—

1. Acute urethritis of gonorrhoeal origin,
2. Acute prostatitis;
3. Acute cystitis;
4. Debilitated, nephritic and anaemic individuals.

Suprapubic Cystostomy

The *purpose of a suprapubic cystostomy is to divert the* flow of urine and to provide adequate drainage of the bladder. It is done for the following conditions :

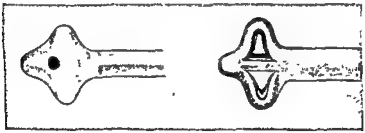
1. strictures or injuries of the urethra;
2. as a preliminary in the operation for Hypospadias;

3. before the operation of prostatectomy; and
4. in neurogenic bladder.

The usual pre-operative measures outlined at the commencement of the chapter are carried out except in cases of emergency. Anaesthesia may be local, spinal or general.

Post-operative care: Intensive antibiotic therapy is a "must" in post-operative care.

The suprapubic catheter is connected to a bottle containing some antiseptic solution. This continuous bladder drainage is kept on for a week or ten days. During this period, irrigation of the bladder is done to clear any infection using solutions like Acriflavine in water. 1 in 8000, Mercury Oxycyanide, 1 in 8000, or Potassium Permanganate 1 in 5000. After irrigation, the Depezzer or Malecot's catheter is connected to a sterile bottle containing antiseptic solution.



(a) (b)

Fig 46(a) Depezzer catheter. (b) Malecot's catheter. Diagram showing two types of self-retaining catheters used for draining the bladder.

During the post-operative period, fluid balance chart must be maintained and the patient must be encouraged to take breathing exercises to prevent any lung complications. A small corrugated rubber drain that is placed in the cave of Retzius is removed after 4 or 5 days. When the suprapubic cystostomy is no longer needed, the Depezzer or Malecot's catheter draining the bladder is removed and an indwelling

catheter per via naturalis is left in position to enable the quick healing of the cystostomy wound.

The complications that have been met with after operations on the bladder are:—

1 Haemorrhage which may occur either from the bladder mucosa or from growths.

2. Abdominal distension. This can be controlled by the usual measures.

3 Hiccough. This can be controlled by inhalations of CO_2.

An intake and output chart must be maintained and the blood urea estimated to note the progress of the patient.

4. Infection in the prevesical space. This is prevented by draining the cave of Retzius in every case of suprapubic cystostomy. If there is any infection, the drain should not be removed before the 5th day.

5 Urine leakage round the suprapubic tube is another common complication. To prevent this, strapping of the abdominal wound is done.

Rupture of the Bladder

Rupture of the bladder should be suspected when a patient gives a history of a fall or blow over the hypogastrium and complains of pain in the suprapubic area and frequent desire to void with no success or the passage of small amounts of blood stained urine. The patient shows some evidence of shock and on physical examination, there is tenderness and rigidity of the abdomen. In these cases, there is urinary extravasation and voiding is difficult. If the urine contains blood, the condition of the bladder must be investigated.

Investigations done are:—

1. Urine examination.

2. Non-protein nitrogen in the blood.

3. Intravenous urogram. This is a safe procedure and quite practical if the patient is not in shock.

4. Cystogram: This is a useful procedure of outlining the extravasation of bladder. A 3 or 4% solution of Sodium iodide is used.

5. Gentle catheterisation is done for diagnosis. When the urethra is ruptured, the catheter will meet with obstruction at the place of injury. If it is able to pass into the bladder, clear urine will be drawn while in rupture of the bladder, urine contains blood.

Pre-operative treatment:

1. Shock treated by blood transfusion followed by 5% glucose in distilled water or saline.

2. Pain relieved by Morphia depending upon the age and weight of the patient.

3. Penicillin and Streptomycin to be started to control infection.

4. Blood pressure and pulse charted every hour.

Treatment:

Immediate operation is necessary in all cases of rupture of the bladder, after combating the shock by blood transfusion or saline.

In intraperitoneal rupture of the bladder, the peritoneal cavity is opened and the urine aspirated from the abdominal cavity. The rent in the bladder is sutured and then the peritoneum closed. The bladder is exposed over the suprapubic region and the tube inserted for suprapubic drainage. In extraperitoneal rupture of the bladder with extravasation, the bladder is opened in the middle line and the interior examined. The site of rupture is noted and a perivesical drain placed. The bladder is also drained by a suprapubic tube and the prevesical space by a small cigarette drain.

Post-operative treatment:

1. Chemotherapeutic and antibiotic drugs are given to diminish the infection.

2. Drainage of the perivesical area to be continued until the healing is complete. The tubes are shortened as the cavity fills in and the discharge lessens.

3. The perivesical drain is left in situ for 4 or 5 days and thereafter gradually shortened.

4. Suprapubic cystostomy catheter is left in position for 15 days. Before removing it, a catheter is passed per-via-naturalis and then the suprapubic tube removed. The fistulous opening usually closes in a few days. During this period, the opening should be strapped so that no urine leaks out and the urethral catheter connected to a bottle or a suction apparatus.

5. If the bladder rupture is associated with a pelvic fracture, an orthopaedic consultation is done.

Diverticula of the Bladder

The clinical picture in these cases are as follows:—

1. Frequency of micturition,
2. Dysuria;
3. 'Instalment' urination;
4. Haematuria

The following investigations should be carried out:—

1. Urine examination and urine culture,
2. Blood urea;
3. Cystoscopy,
4. Excretion urography: This will reveal the bladder diverticulam
5. Cystography: 5% Sodium iodide solution is used and about 10 to 15 ozs. are used to distend the bladder Anterio-posterior and oblique pictures are taken to show the size of the bladder and the pouch. The patient then micturates as completely as possible Another X-ray picture is taken to show whether the diverticulam contains the radio opaque dye or not.

Pre-operative treatment:

1. Urinary antiseptics to control infection;
2. Intake and output chart maintained;
3. Electrolyte imbalance corrected.

FIG 47 Roentgenogram showing a bladder Diverticulam Dye retained in the diverticulum after the bladder was emptied.

Post-operative treatment:

1. After the removal of the diverticulam, the blood loss during the operation is corrected by transfusion.

2. Intravenous fluids are given till the patient is able to take enough fluids by mouth.

3. Antibiotics are continued during the post-operative period.

4 Blood chemistry to check upon the progress of the patient.

5. Suprapubic catheter is connected to a bottle or suction apparatus.

6. Bladder irrigations are done twice a day for the first week.

7. The cave of Retzins drain is removed between the 3rd and 5th day.

8. The perivesical drain, which is used to drain the space where the diverticulam was present, is removed on the 3rd or 4th day.

9. Suprapubic tube is removed after the 10th day.

Benign Tumours of the Bladder

The adage that profuse, painless, periodic haematuria is diagnostic of papilloma of the bladder is very often true. When the tumour is very big, it gives rise to increased frequency and a feeling of incomplete emptying of the bladder. If the tumour blocks the internal urinary meatus, the patient complains of difficulty in micturition or an intermittent stream. The usual pre-operative investigations and preparations should be done.

Benign growths of the bladder can be fulgurated and, after such a treatment, the bladder is drained by catheter placed per via naturalis for about 10 days. During the operation and in the post-operative period, blood transfusion may be necessary In the post-operative period, there is risk of secondary haemorrhage which can be controlled by the usual measures like giving anticoagulants and washing the bladder with Silver Nitrate solution 1 in 5,000 to 1 in 2,000. Infection is controlled by antibiotics. These patients must have cystoscopic examinations done regularly to find out if there is any recurrence of the benign growth which was removed by fulguration.

Pre- and Post-Operative Orders for a case of Transplantation of ureters

A careful pre-operative examination is essential in addition to the usual investigations Intravenous urography and retrograde pyelogram should be done to find out the functional and structural changes in the kidney and ureters. Blood chemistry and renal function tests must be done to assess the risks for this operation.

1. The bowel must be cleaned by giving the patient a saline purge or castor oil on two nights preceding the operation.

2. Pthalyl Sulphathiozol should be started 0·1 gm/Kgm body weight every 4 hours or Sulphaguanidine or Sulpha-succidine 10 gm. st. and 4 gm. every 4 hours. By the 5th day, the bacterial flora in the colon will be completely altered and the motion becomes soft and odourless. The patient must have the bowels moved daily. Patients are given a low residue diet for the first three days and then a liquid diet for the next two days before operation.

Pre-operative Orders:

1. Nothing by mouth after 8 P.M.
2. Abdomen, genitalia and perineum prepared.
3. Saline enema to be given the night preceding operation and again early morning. Following the last enema, a rectal tube is passed to drain off any retained fluid and is left in place until the patient is taken into the operating room.
4. Phenobarbitone or Sodium Amytal should be given at bed-time to ensure rest and sleep
5. Penicillin 5 lakhs three times a day, starting two days before operation.
6. Streptomycin, 1 gm. a day, or Aureomycin 1000 mgm. a day for two days before operation.

The operation is done under general or spinal anaesthesia. During the operation, the shock and fluid loss is combated by blood transfusion and glucose saline transfusions

Post-operative Orders:

The patient returns to the post-operative ward with the following orders written on his case sheet.

1. Patient has a large rectal tube kept in position by a stay stitch. This is connected to a bottle.

2 In some cases, the surgeon passes No. 5 catheters into each ureter before a Nesbit type of anastomosis is done. These catheters should be marked right and left and are connected to small sterile rubber tubes which lead to separate sterile bottles hung to the bed. The catheters are kept in position for about [illegible] to 10 days. The rectal tube is left in position for several days longer. It is very essential to see that when a rectal tube is passed, it does not go more than 2" above the anal sphincter. Patency of the rectal tube should be ensured and, if blocked, it should be removed, cleaned and reinserted. If the catheters have been used for draining each ureter, their patency should be tested by the surgeon, injecting about 2 c.c. of sterile saline and then aspirating the catheter again.

3. No enema should be given for these patients and a red card to this effect should be attached to the head end of the bed to serve as a warning for the nursing staff.

4. After the patient has recovered from the anaesthesia, the head of the bed should be elevated about six inches and sufficient narcotics should be given to keep the patient quiet.

5 Post-operative distension is prevented by having an indwelling Ryle's tube for 48 to 72 hours and a Wangenstein's suction syphonage is used as a routine.

6. Nothing is given by mouth for the first 48 to 72 hours.

7. Patients must receive 3—4 pints of fluid every day, the fluid being one pint of 5% glucose saline and three pints of 5% glucose in water. Too much of saline should never be given as the patient is likely to go into a stage of Hyperchloraemia. Intake and output chart should be kept and the fluid balance is maintained *for 72 hours by venoclysis.*

8. The Ryle's tube is removed as soon as intestinal peristalsis has started.

9. Antibiotics or chemotherapy is given for 7 to 10 days post-operatively or until the patient is afebrile.

10. Blood chemistry determinations like—

    (a) Blood urea,

    (b) CO_2 combining power

are done every third day. If the patient is going on to a stage of acidosis, Soda Bicarb has to be given, about 8 gms. a day, to restore the CO_2 combining power to normal. If the patient is not able to take anything by mouth, ⅙th molar Sodium Lactate solution should be given intravenously in amounts of 500 to 1000 c.c.

11. These patients can move about on the 3rd day or 4th day, the surgeon deciding when they can be ambulant.

If there is no distension or infection, convalescence is remarkably smooth. After the patient has been discharged, he should attend the check-up department to find out if there is any electrolyte imbalance following uretero-intestinal anastomosis. The cause of the electrolyte disturbance is thought to be due to intestinal distension transmitted through ureter and pelvis to the kidney causing renal parenchymal damage particularly of the tubules. Increased intrapelvic and intratubular pressure leads to a fall in the glomerula filtration rate which causes diminution in the excretion of chloride and sodium.

If infection occurs, the kidney damage is rapidly increased and the patient may pass into a state of hyperchloraemic acidosis. Kidney damage caused by the pressure is reversible to a certain degree, since insertion of a rectal tube can correct the electrolyte imbalance.

Prophylaxis for hyperchloraemic acidosis is salt limitation, increased fluid consumption and Sod. Bicarbonate taken orally.

The patient should evacuate often and a rectal tube should be inserted at night in severe cases.

Thus, these patients with uretero-intestinal anastomosis must have the following investigations done when they come up for a check-up

1. Blood chemistry.
2. Excretory urogram.
3. X-ray of the bones to find out if there is any osteomalacic changes due to hyperchloraemic acidosis.

The proper management of patients with uretero-intestinal anastomosis must include:—

1. A fluid intake of 4000—5000 c.c daily.
2. Frequent emptying of the rectum (every 1½—2 hours).
3. A low chloride intake.
4. Supplementary sodium, usually 1—4 gms. of Sod. Bicarbonate per day.

Cystectomy

The surgical treatment of bladder tumours consists in doing a partial or a total cystectomy. The operation of total cystectomy may be done in one or two stages. The first stage consists in transplanting the ureters into the bowel and the second stage is done three weeks later. If the general health is very good and the renal function is satisfactory, the operation of cystectomy and transplantation of the ureters can be done in one stage. When this operation is done for malignant neoplasms of the blader, a complete removal of the bladder, prostate, seminal vesicles and lymph glands along the major vessels are done.

The usual pre-operative treatment and investigations as mentioned under the chapter "Transplantation of the Ureters" are carried out. In addition, the following investigations are done:—

1. A cystogram and pneumocystogram to show the filling defect.
2. Cystoscopic biopsy and grading of the tumour.
3. Collection of urine for 24 hours and cytological diagnosis done by Papanicolaou's method.

Post-operative care:

1. Shock must be combated by blood transfusion.
2. High fluid intake must be maintained.

Fig. 48(a) Cystogram showing the filling defect due to a growth in the bladder.

Fig 48(b) After removal of the bladder it was filled with Radio opaque dye and X-ray taken to show the filling defect caused by the growth.

3. Antibiotics or chemotherapeutic drugs are given to control infection.

4 Blood chemistry should be done every other day in the post-operative period (Blood urea, blood sodium, blood potassium and blood chlorides) to decide on the type and amount of fluid therapy.

5. The cigarette drains that are placed from where the bladder was removed should be shortened every other day and removed by about the 5th day.

FIG. 48(c)
Pnemo cystogram showing the growth filling half the bladder cavity.

6 In cases of partial cystectomy, the perivesical drain is removed on the 3rd or 4th day and the suprapubic cystostomy tube at the end of 2 weeks. If total cystectomy was done by a combined abdomino-perineal method, the drainage tubes are brought out through the perineum. These tubes are gradually shortened every other day and removed by about the 5th or 6th day.

7. The skin sutures are removed on the 10th or 12th day.

Pre-operative and post-operative care of prostatic patients:

Prostatic hypertrophy may be present in varying degrees in men past the age of 50. The most characteristic symptom is slowness of the urinary stream; later frequency, dysuria, haematuria and retention of urine developes. As a result of the enlargement of prostate, back pressure or infection or a combination of the two causes a gradual and increasing irreparable damage to the kidneys and the patient may pass on to a state of uraemia When the patient develops uraemia, gastro-intestinal symptoms and nervous manifestations develop.

The investigations done for a case of prostatic hypertrophy are as follows:—

1. Urine examination (chemistry, cytology and bacteriology);
2. Digital palpation of the prostate and the size of the prostate noted.
3. The amount of residual urine is estimated.
4. Excretory urogram
5. Cystogram—intravesical enlargement of prostate will be shown as a filling defect.
6. Blood chemistry like blood urea, blood chlorides, CO_2 combining power of blood and Serum Acid Phosphatase.
7. Cystoscopy to note the degree of intravesical enlargement.
8. (a) In cases where malignancy of the prostate is suspected, in addition to the above investigations, a needle biopsy of the prostate through the perineum or biopsy transurethrally may confirm the diagnosis.

   (b) Examination of the prostatic fluid obtained by massage and staining it with Papanicolaou's method may be useful in diagnosing a suspected case.

9. X-ray of the pelvic bones and lungs to find out if there are any metastasis.

The **pre-operative care** of these patients is essentially the same whether the operation is done by the suprapubic, retropubic, perineal or transurethral method.

1. Improving the renal function must be our objective.
2. Gradual decompression should be done in all cases. This can be done with the help of an indwelling catheter per via naturalis or by a suprapubic cystostomy.
3. Blood pressure determination should be done every third day.
4. Fluid intake must be maintained between 3000—4000 c c a day.
5. Blood urea should be estimated.
6. Intravenous pyelogram to ascertain renal function.
7. Cardiovascular system must be checked up.

When the patient is having a catheter drainage or suprapubic cystostomy, the bladder is washed twice a day with 1 in 10,000 Acriflavine solution The indwelling urethral catheter must be changed on alternate days and the suprapubic tube every 3 weeks. In afebrile cases, the patient can be permitted to be out of bed the major part of the day. An intake and output chart should be maintained and the following blood chemistry determinations should be done:—

1. Non-protein nitrogen,
2. CO_2 combining power of blood,
3. Blood urea,
4. Renal function tests.

The house surgeon should give specific instructions to the nurse and note down in the order book the following special preparation for a case of prostatectomy:

1. Sedative: Phenobarbitone gr. [illegible] or seconal sodium or Dial at 8 P.M.

2. Soap and water enema just before the patient goes to bed and another in the morning.

3. Entire abdomen and the genitalia should be shaved.

4. Patient's blood should be grouped and 500 c.c of blood should be available at operation.

5. Nothing should be given to the patient by mouth after midnight in cases which are done under general anaesthesia, but fluids are allowed and the patient can have a cup of coffee early morning if he is to be operated under spinal anaesthesia.

6. If the patient is having a suprapubic tube or indwelling catheter, the bladder should be washed in the morning with aqueous Acriflavine 1 in 8000 before operation.

7. Morphia and atropine should be given as a premedication after consultation with the anaesthetist.

Post-operative treatment:

1. Drainage of the bladder is usually by means of a suprapubic tube or by indwelling catheter or both.

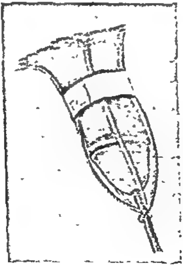


FIG. 49. Diagram showing the method of fixing a urethral catheter by strings and adhesive tape.

2. Haemostasis is secured by plugging the prostatic cavity with gel foam and roller gauze or, if a Foley's bag is available, this is passed per urethra and the bag is distended so that it fits into the prostatic cavity and a steady traction on the bag is maintained for 6-8 hours to stop bleeding.

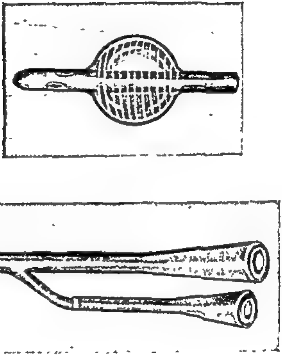


FIG III(a) Diagram showing sections of a Foley's catheter.

Once the drainage from the bladder gets clear, then the traction on the bag could be released. The catheter can be removed on the 2nd or 3rd day depending upon the local condition. If gauze pack has been used to control bleeding from the prostatic bed, half of it is usually removed on the 2nd day and the rest of it on the 3rd day of operation. There may be a little oozing after removal of the gauze pack but this usually stops within a few hours. Removal of the gauze pack is very painful and hence is done under gas and oxygen anaesthesia.

Some surgeons leave a urethral catheter for a few days and connect it to a bottle. Other surgeons use both suprapubic tube and urethral catheter for drainage of the bladder and they leave the suprapubic tube for 10 days. After the suprapubic tube has been removed, the urethral catheter is reinserted to prevent leakage through the suprapubic wound. All these cases have a drainage tube in the space of Retzius which is removed after 72 hours. Once the urine has become clear, the patient is allowed to get out of bed.

3. The foot of the bed is raised for about [illegible] hours if operation was done under spinal, and if done under a general anaesthesia, the patient is kept flat in bed.

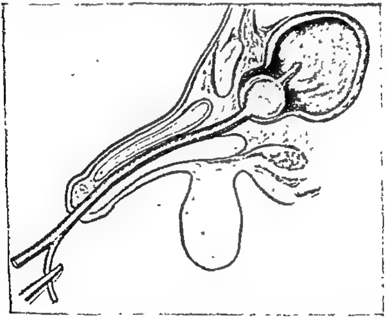


FIG. 50(b) Diagram showing the Foley's bag fitting into the prostatic bed for ensuring Haemostasis.

4. Blood pressure should be recorded every 15 minutes for the first hour, every 30 minutes for the next two hours, and every hour for next 6 hours and then periodically, depending upon the patient's general condition and the extent to which he has recovered from shock.

5. Pulse and respiration should be recorded every half an hour.

6. 4th hourly temperature chart is to be maintained.

7. As soon as the blood transfusion is over, the patient is given one pint of 5% glucose in normal saline, one pint of 5% glucose in water and 1 pint of Soda Sulph 4·285 gm.% intravenously by the drip method.

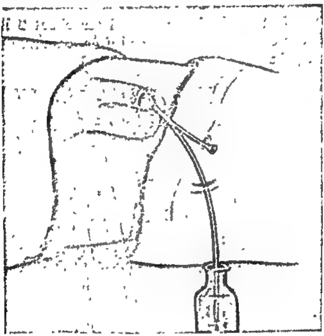


Fig. 50 (c) Foley's catheter connected to a bottle for continuous bladder drainage

8. Nothing is given by mouth for the first twelve hours and small amounts can be given thereafter, if there is no distension or vomiting. Usually the patient takes small amounts by mouth on the second day after operation.

9. If the patient does not recover from shock, blood transfusion or plasma transfusion or any one of the latest preparations like Dextran, Intradex or Plasmosan should be given before intravenous saline is started.

10. Pain is relieved by morphia or omnopon and this may be repeated every 6 or 8 hours for the first 24 hours.

11. The output chart should record, the amount coming through the suprapubic tube and the urethral catheter separately.

12. No irrigation of the bladder should be done without instructions from the surgeon.

13. Abdominal distension is controlled by having an indwelling Ryle's tube and establishing Wangenstein's suction syphonage. When this is done, fluids must be given intravenously to combat the loss.

14. Patient is given an enema on the 3rd day after operation and thereafter he is given laxatives for his bowels to move.

15. Post-operative infection is controlled by antibiotics or chemotherapeutic drugs, and the patient can be given a combination of Penicillin and Streptomycin or Aureomycin or Terramycin or Sulpha drugs.

16. The skin sutures are removed on the 10th day.

Transurethral Resection

The pre-operative preparation of a patient for transurethral resection is the same as for a case of enucleation of the prostate. In patients with little residual urine and good kidney function, very little preparation is necessary.

Post-operative care:

The patient returns to the post-operative ward with an indwelling catheter which is connected to an irrigating set containing 1 in 8000 Acriflavine solution. The drainage through the catheter is collected and inspected for any undue haemorrhage. If there is no free drainage, then irrigation may have to be done to dislodge small clots. If the catheter is completely blocked, then the surgeon should be informed.

If the bleeding is severe, blood transfusion should be started immediately and the surgeon informed. As soon as the bleeding has completely stopped and the colour of the urine returns to normal which usually happens on the 2nd or 3rd day, the catheter is removed. Before it is removed, the bladder is washed with Acriflavine solution and filled with the same solution. The patient is asked to void and, if there is any difficulty, the catheter should be reinserted.

Complications after prostatectomy

The complications after prostatectomy are :—

1. Haemorrhage. This may occur as soon as the patient has recovered from the effects of anaesthesia The blood pressure rises and the patient gets a reactionary haemorrhage. If the bleeding is profuse as shown by the rising pulse rate or by the amount of blood drained into the bottle, he should be given a bladder wash using a hot solution of silver nitrate, 1 in 4000, and haemostatics parenterally. If the bleeding is very severe, blood transfusion is given and then the bladder may have to be reopened and the cavity packed with gauze.

In cases after transurethral resection, the bladder is evacuated of clots by means of suction, using an Ellick evacuator and bleeding controlled by methods suggested above.

2. Shock. This is treated by giving the patient blood transfusion or plasma transfusion or any one of the latest preparations like Dextran, Intradex or Plasmosan During the operation itself, the patient must have blood transfusion and the patient's blood pressure and pulse rate should be watched before giving another bottle of blood or plasma. If he has recovered from shock, he is given intravenous saline, 1 pint, and followed by 2 pints of 5% glucose in distilled water.

3. Uraemia. This is likely to occur if the renal function is not at its best at the time of operation. This is treated by

maintaining the fluid balance. The blood urea should be estimated every day.

4. Anuria. This is also likely to occur after operations on the prostate and is corrected by the same measures mentioned above.

5. Infection of the prostatic bed. This is controlled by chemotherapeutic and antibiotic drugs.

6. Cystitis and pyelo-nephritis are controlled by antibiotics or chemotherapeutic drugs.

7. Epididymitis is another important complication which can be prevented by vasectomy done at the time of prostatectomy. If vasectomy has not been done, the epididymis is likely to become infected. The patient develops temperature and the scrotum becomes oedematous. The epididymis becomes painful, tender and enlarged. Antibiotics or chemotherapeutic drugs are given to control the infection.

7. Persistent suprapubic fistula after prostatectomy may be another important complication and this may be due to:

a. inadequate removal of the prostate;

b. stricture of the urethra;

c. a valve of vesical mucosa overlaping the new prostatic urethra;

d. a fibrous stricture in the region of the neck of the bladder.

If the suprapubic wound does not heal, a rubber catheter is passed per urethra and a continuous drainage of the bladder is done to allow the suprapubic wound to heal.

In some cases, dilation of the bladder neck may have to be done with metal sounds.

Urethra

Injuries to the urethra may occur to a patient landing on his perineum due to a fall from a height. Sometimes, it may occur due to gun-shot wounds or stab wounds,

The pre-operative treatment in such cases would be:—

1. *treatment of the shock;*
2. treatment for extravasation of urine which is likely to occur if the patient attempts to pass urine after the injury;
3. treatment for severe haemorrhage and perineal haematoma;
4. treatment for infection of the tissues.

In cases of rupture of the bulbous portion of the urethra, the patient will have pain and swelling at the site of the injury, blood at the external urinary meatus and retention of urine. This usually occurs due to a blow on the perineum.

The patient in these cases should not pass urine and with all aseptic precautions, a catheter must be passed. In cases of incomplete rupture of the urethra, the catheter may pass easily. The perineal haematoma is incised and drained and the catheter that has been left in situ is used for washing the bladder daily. If the patient has got a complete rupture, a suprapubic cystostomy should be done and the urine diverted The haematoma in the perineum is incised and evacuated. Repair of the urethra may be carried out immediately or after some time, depending upon the degree of infection and damage that has been caused. If the damage has been very severe and the general condition of the patient poor, a suprapubic cystostomy alone should be done.

Post-operatively, urethral dilatation has to be carried out regularly as traumatic strictures of the urethra are the most difficult to treat.

In the case of rupture of membraneous urethra, the patient may have signs of fractured pelvis also present with extravasation of urine into the prevesical space Severe pain, shock, swelling in the hypogastric region and blood at the external urinary meatus are the cardinal signs in this type. The treatment consists in doing a suprapubic cystostomy and leaving a catheter in situ per via naturalis. Post-

operatively, bladder irrigations are carried out twice a day. The drainage tubes from the region of the cave of Retzius and paravesical space are removed on the 3rd and 5th day respectively and the indwelling catheter and suprapubic tube are removed on the 14th day. Intermittent dilation with sounds should be carried out after 4 or 5 weeks.

Infection in the post-operative period is controlled by antibiotics and chemotherapeutic drugs. The fracture of the pelvis in these cases should be treated simultaneously.

Stricture of the urethra

The history of the patient together with the symptoms of frequency, difficulty and dribbling suggest the possibility of a stricture of the urethra.

The following investigations are carried out: —

1. Urine examination and urine culture;
2. Examination of the urethral discharge;
3. Excretory urogram;
4. Urethrogram;
5. Cystourethrogram;
6. Urethroscopy;
7. Renal function tests.

Post-operative management consists of the following: —

1 High fluid intake;

2 Infection controlled by antibiotics;

3. Intake and output chart maintained;

4. If the patient is not able to pass urine after the operation, a metal catheter is passed to drain the bladder.

5. Dilatation is repeated depending on the type of stricture. In a satisfactory case, instrumentation can be performed at intervals of 2, 4 and 8 weeks and finally at periods of 3, 6 and 12 months.

6. In cases where dilatation cannot be done, the bladder is drained suprapubically; after two weeks dilatation of the urethra is done.

Operations on the penis may be :—

1. dorsal slitting;
2. circumcision;
3. partial or total amputation.

Dorsal slitting has to be done in cases of phimosis. This is an emergency procedure which is done for cases who have an acute retention of urine due to phimosis. Post-operatively, they are given antibiotics to control infection like balanoposthitis which they invariably have and Bromide mixture to control painful priapism.

Circumcision :

The usual preparation of shaving the patient and washing with ether soap is done and, under local or general anaesthesia, circumcision is performed. The patient gets Bromide mixture for 3 or 4 days to control painful priapism. Stilboesterol, [illegible] mgm a day, can be given along with the bromide mixture for adults. The vaseline gauze strips, which are tied to the edges of the circumcision wound with catgut that has been used for suturing, protect the wound for about 7 to 10 days. These sutures of catgut are not removed and they usually fall away when the patient takes a bath on the 7th or 10th day.

Complications after circumcision :

1. A troublesome complication after circumcision in the adult is post-operative priapism. A bromide mixture for children is helpful in allaying erection. In adults, bromides and Stilboesterol are given.

2. Haemorrhage sometimes occurs in the region of the fraenum. This complication is prevented if the surgeon uses

the three in one fraenal stitch. When the bleeding is from the cut edges, interrupted stitches at those places usually controls it. If the bleeding continues, haemophelia must be suspected.

Fig. 51. Diagram showing the method of applying the fraenal stitch

Amputation of Penis

Total amputation is done for cases of cancer of the penis. These patients must have the usual investigations done which consist of: —

1. urine examination,
2. Renal function tests,
3. a complete examination of the respiratory and cardio-vascular system,
4. biopsy of the growth.

The part should be cleaned and the growth covered with acriflavine gauze, the general health and the anaemia being improved before the operation.

Post-operatively,

1. Shock is treated by blood transfusion and this is followed by plasma or saline transfusion.

2. Pain is relieved by morphia.

3. The catheter that has been passed into the bladder is connected to a rubber tube which dips into a bottle contain-

ing some antiseptic solution. This continuous bladder drainage is carried on for a week or ten days.

4. The drain from the perineal wound is removed after 48 to 72 hours.

5. Infection is controlled by antibiotics.

Partial amputation of Penis

In these cases, the growth is covered with acriflavine gauze for a few days and the secondary infection cleared by administration of antibiotics.

Post-operative care : —

1. Infection must be controlled by chemotherapeutic or antibiotic drugs.

2. Urethral catheter is connected to a bottle for continuous bladder drainage.

3. Priapism prevented by bromide mixture and Stilboesterol tablets.

4. Skin sutures are removed on the 9th day.

Operation on the testis

This may be either an Orchidectomy for cases of malignant or tuberculous disease of the testis, or Orchidopexy for cases of undescended testis, or eversion or excision of Tunica Vaginalis in cases of Hydrocele and Haemotocele.

The pre-operative preparation is similar to any major operation like Hernia. The skin of the scrotum must be shaved and cleaned thoroughly with ether soap.

Post-operatively, the patient is on antibiotics and the drainage tube is removed after 48 hours. The skin sutures are removed on the 6th day. After operation, the patient usually has a mild retention of urine which can be relieved by catheterisation.

Patients who have had Orchidectomy for malignant disease are kept under close observation and followed from

time to time. Deep X-ray therapy for the lumbar glands may have to be given for cases of chorion-epithelioma and seminoma of the testes. In cases where Orchidectomy has been done for tuberculosis of testis, Streptomycin therapy and general treatment should be given.

Pre-operative and post-operative treatment for Hydrocele operations are the same as in cases of Hernias. After the operation, the scrotum must be bandaged and supported to prevent any haematoma formation. Patient is kept under an umbrella of antibiotics to control infection. In cases where excision of the sac has been done, a drainage tube is invariably kept which is removed after 48 hours.

Orchidopexy

This operation is done when the patient is about 8—10 years old. Hormonal treatment is tried before the patient is submitted for operation. There are various methods of doing this and they are :—

1. Trans-septal orchidopexy of Ombredane;
2. Bevans method;
3. Keetly Torek method.

In the Bevans method, the testis is kept in the scrotal compartment of the same side by a catgut suture which is passed through the gubernaculum and both ends of the suture are threaded in one needle and carried through the most dependant portion of the scrotum; the ends of the suture are tied together through a rubber band. This rubber band is fixed to the thigh with an adhesive tape. The rubber band maintains continuous traction for about three weeks till the testis gets adherant in the scrotal compartment. The band must be watched and adjusted from time to time to maintain an even and continuous tension. The catgut may be removed after 20 days. When the condition is bilateral, the operation is done in stages.

In the Keetly Torek procedure, the testis is brought outside through the scrotal compartment and implanted in the thigh. After 2—3 months, the testis is freed and placed in the scrotal compartment of the same side and sutured.

Hypospadias and Epispadias

Hypospadias is an abnormality which is encountered quite commonly. The urethra opens in an abnormal position either in the area of the frenulam or on the ventral surface of

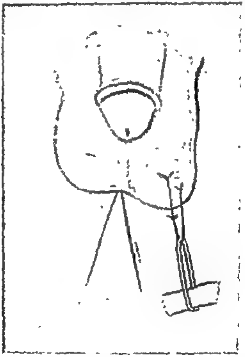


FIG 52. Diagram showing Bevans operation where elastic traction is applied to hold the testicle down The catgut passed through the Gubernaculum is brought outside and tied round an elastic band for traction This elastic band is fastened to the thigh with adhesive tape. The rubber band maintains continuous traction for about three weeks.

the penis or even in the perineum. These patients may have varying degrees of chordee. When dealing with a patient of peno-scrotal or perineal hypospadias, care must be taken to

find out whether the subject has other reproductive abnormalities.

1. Rectal examination to find out if uterus is present.

2. Injection of radio opaque material into the urethral meatus to find out whether the urethra is connected to the bladder or whether the external orifice is actually the termination of a urogenital sinus which receives both the urethra and female genital tract.

3. Determination of the level of urinary excretion of 17 keto steroids and, if elevated, it suggests the presence of an adreno-genital syndrome which has produced masculanisation and enlargement of the phallus of the female subject.

4. If there is difficulty in the identification of the sex, a laprotomy should be done to find out whether the patient has the ovaries and the uterus.

The operation for hypospadias is usually done after the youngster attains the age of 5 or 6.

The *pre-operative preparation* in these cases consists of the following:—

1. The skin over the penis, scrotum and perineum should be shaved and cleaned with soap and water.

2. Infection is prevented by placing the patient under an umbrella of antibiotics a day or two previous to the operation itself

3. The operative procedure of repair is done in stages.

4. Absolute asepsis is essential.

5. Diversion of the urinary stream is done by perineal urethrostomy or suprapubic cystostomy.

6. Complete control of bleeding is absolutely essential since tension at the suture line will result in failure of the operation.

7. The skin-flaps must have good blood supply and the skin for the urethra must be non-hair bearing.

The success of the operation depends upon the post-operative care: —

1. The catheter which has been left in place for urinary drainage is connected to a suction apparatus and is removed after 14 days. Catheter irrigations with half strength suby solution G is done daily to maintain the catheter patency and prevent calcareous deposits on the catheter.

The bladder should be drained during the whole post-operative period till the plastic repair on the penis has healed.

2. Intravenous fluids are given if necessary, in case fluids and diet are not tolerated orally.

3. Antibiotics are continued in the post-operative period (Penicillin and Streptomycin).

4. Restlessness due to pain must be avoided and sedation with Phenobarbitone or Paraldehyde depending on the age and weight of the patient.

5. Priapism is common after these operations and this can be prevented by administration of Stilboesterol, 5 mgm daily, starting about 2 days before the operation and continued in the post-operative period for adults for 4 or 5 days. In children, bromides are given. The dressing that has been applied over the penis should not be disturbed.

After removal of the catheter, the wound closes spontaneously within a few days.

Silk sutures are removed on the 7th or 8th day and the wound should be kept as dry as possible by dusting with sulphonamide powder.

Complications.

Wound infection or wound breakdown can be prevented by: —

(a) complete diversion of the urinary stream either by a suprapubic catheter or by a perineal urethrostomy.

(b) prevention of penile erection.

(c) control of infection by antibiotics.

(d) gentleness in operation.

In the post-operative period, after the wound has healed, the patient should have urethral dilatation done to find out the patency and size of the urethral canal before discharge.

Epispadias

In cases of *epispadias*, the operation is usually done after the younger attains the age of 3 or 4.

In epispadias, the suprapubic catheter is removed on the 21st day. After removal, the size of the new urethra is determined by passing fine catheters. The child should be instructed to regain normal control by exercises like starting and stopping suddenly the act of micturition.

The complications are urethral fistula and incontinence which has to be corrected by a second operation.

Uraemia

Uraemia is a clinical manifestation of renal insufficiency. The symptoms of uraemia may be divided into cerebral gastro-intestinal and respiratory.

The cerebral type of uraemia is the one most commonly seen in acute nephritis and consists of severe head-ache lethargy and convulsions.

The gastro-intestinal symptoms are, nausea, vomiting and diarrhoea

The respiratory symptoms appear late and is characterised by attacks of dyspnoea and cheyne-stokes type of breathing. The Urologist frequently meets cases of chronic uraemia due to the following causes:

1. Bladder neck obstruction due to Prostatic enlargement.
2. Renal calculus.

3. Strictures of the Urethra.
4. Cystitis and Pyelonephritis.

In addition to the above symptoms, these patients have a dry tongue with changes in the retina and rise in blood urea. Anorexia, drowsiness and later halucinations develop followed by severe hiccough.

Investigations:

A complete blood chemistry must be done.

1. Blood Urea.
2. Serum chlorides.
3. Carbon dioxide combining power of blood.
4. Serum Potassium.
5. Serum Sodium.
6. Serum Calcium.
7. Routine blood examination. (Hb %, R.B.C. and W.B.C. count)

Treatment:

Before submitting these ureamic patients to operation, care must be taken to correct anaemia and blood chemistry. Shock, if it occurs during operation should be treated immediately. If Uraemia is present, the patient should have fluids by the intravenous route. The amount given should not be more than 1000 ml. per day. At the same time, the blood chemistry must be determined and if the patient has developed hypochloraemia, saline must be given by the intravenous route. Sodium sulphate (4.285 G %) in doses of ½ to 1 pint can also be given by the intravenous route to promote diuresis in cases of anuria due to incompatible blood transfusion or after major operations on the kidney.

The amount of urine passed following operation should be measured and recorded in the intake and output chart daily. When the renal function is known to be poor the

blood chemistry should be done and diuresis maintained by the liberal administration of fluids. When the Urinary excretion is diminished, efforts should be made to increase diuresis by forcing fluids by mouth as well as intravenously. Warm colonic irrigations are also given and in some cases hot packs or dry cupping or diathermy is applied to the renal areas.

If the output of urine is below 20 ounces in 24 hours, the Borst diet is given through an indwelling Ryle's tube as an intra-gastric drip.

Borst diet consists of:

Glucose 400 G.
Olive oil—100 G.
Mucilage of Acacia Q.S.
Aqua add 1000 c.c.

This diet gives the necessary calories for the day. When the urine output has returned to normal the blood chemistry must be constantly done to find out whether the patient has recovered from the effects of uraemia or not. If acidosis has occurred $\frac{1}{6}$th molar sodium lactate solution is given intravenously.

Soda bicarb can also be given by mouth in doses of ½ to 1 drachm every six hours.

If toxic products which accumulate in the blood as a result of kidney failure cannot be removed by the above simple methods, Transperitoneal or intra-intestinal dialysis may have to be done. Lavage of the peritoneal cavity may be done continuously or intermittently. If peritoneal dialysis is to be done, care must be taken to see that the patient does not get pulmonary oedema, cardiac failure or severe dehydration. Hence a good biochemist must constantly check the blood condition if the uraemia is to be corrected. In some cases the blood calcium may drop and intravenous calcium gluconate may have to be given. In others, hyper-potassaemia

may occur which has to be corrected by the administration of insulin, glucose and testosterone.

In countries where Kolff's apparatus is available, large quantities of urea and toxic products in the blood can be removed by blood dialysis. By this method, some of the patients can be kept alive for days and weeks.

Management of Anuria

Swift Jolly has classified anuria into pre-renal, renal and post-renal causes.

Pre-renal anuria is usually due to circulatory changes that interfere with the filtration of fluids from the blood as it passes through the glomeruli. Cessation of renal secretion occurs due to a fall in blood pressure for example in severe shock, haemorrhage or dehydration. It may also occur after a spinal anaesthesia, when it is due to a fall of blood pressure. The anuria in these cases being transient. Sometimes it may be due to a slowing of the circulation rate for example cardiac failure.

Renal anuria is due to destructive changes in the secretory epithelium of the kidneys. Thus when tubal damage occurs as in cases of crush syndrome, incompatible blood transfusion, sulphonamide intoxication, acute nephritis ecclampsia and acute yellow atrophy of the liver, anuria occurs.

Post-renal or obstructive anuria occurs due to calculi, new growths and accidental ligation of ureter etc.

Management: The cause of anuria must be noted and treatment must be done accordingly.

(a) Restoration of blood volume, blood pressure and haemoglobin level to as near normal as possible by transfusion.

(b) If it is due to obstruction, cystoscopy and catheterisation of both ureters must be done. If the obstruction

cannot be relieved by simple procedures, nephrostomy must be done.

(c) estimation of blood sodium, chloride, bicarbonate and urea must be done every day.

(d) *Fluid intake* must be limited to about one litre daily so as to approximate to the daily insensible loss.

(e) High carbohydrate and low protein diet must be prescribed.

(f) Peritoneal dialysis may be helpful in rapid restoration of electrolyte balance in blood.

(g) When diuresis has started fluid intake must be raised to balance total fluid loss which consists of urine added to insensible loss.

(h) Salt intake made to balance salt excreted in urine. Half daily volume of urine excreted indicates approximate amount of normal saline required by mouth.

The progress of the patient must be checked by estimating blood sodium, chloride, bicarbonate and urea every 2 or 3 days until the patient passes normal amount of urine every day.

CHAPTER 21

ACUTE ABDOMINAL EMERGENCIES

Strangulated Hernia

For this condition, the following pre-operative measures are indicated:

1. A Ryle's tube is passed into the stomach or better still, a Miller Abbott tube, and a Wangenstein suction syphonage is applied to decompress the intestines as soon as the patient is admitted into the Hospital.
2. An enema is given to empty the lower bowels.
3. Fluids are given parenterally as the patient gets dehydrated very quickly especially when there is intestinal obstruction.
4. Morphia should be given to relieve pain after consulting the anaesthetist.

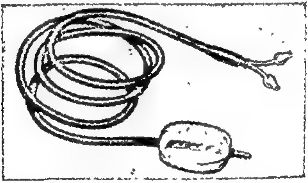


FIG 53 (a) The Miller Abbott Tube used for decompressing the intestines in Intestinal Obstruction or Paralytic ileus.

5. 400 to 500 c.c of blood must be ready in the operating room for transfusion during the operation.
6. Abdomen, perineum, scrotal region and the back should be prepared for operation
7. Blood pressure recorded.
8. Urine examination.
9. HB estimation.

Post-operative management:

1. Continuous suction to decompress the intestines must be maintained for the next 48 hours.

2. After 400 c.c. of blood has gone in, the patient can have a couple of pints of 5% glucose in water or saline to combat dehydration.

3. As soon as the patient is able to pass or eliminate gas normally, the suction syphonage is stopped and fluids can be given by mouth.

4. Patient should be kept on fluid diet for two or three days.

5. If the patient has abdominal distension, Turpentine stupes to the abdomen are applied and a flatus tube passed. If it does not respond, patient may be given Calcium Pantothenate as an intramuscular injection and repeated every 6 or 8 hours. All fluids by mouth should be stopped and a continuous suction through a Ryle's tube must be applied and maintained till the patient recovers from ileus.

6. Patient should have antibiotics or chemotherapy for the first 5 or 6 days.

7. Morphia 1/6 gr. is given as an injection to relieve pain and may be repeated if the surgeon orders.

8 Intake and output chart should be maintained and the patient must have about 2000 c.c. of fluid Intravenously every 24 hours till he recovers from distension or ileus and is able to take fluids by mouth.

9. Enema is given on the 3rd or 4th day.

10. Retention of urine has to be treated by catheterization

11. Sutures should be removed on the 9th day.

12. If resection of the gut has been done the same post-operative care as mentioned above must be instituted.

Acute Appendicitis

The Investigations are:

1. W. B. C. count and differential count.
2 Urine analysis.

3. Blood pressure. Pulse rate and respiration recorded every half an hour.

4. Motion examination for evidence of amoeba or blood.

The **Pre-operative** measures are:

1. Patient should be started on 5% glucose in water or saline intravenously by the drip method.

2. Ryle's tube should be passed into the stomach and the contents syphoned off.

3. No morphia should be given until the diagnosis is established.

4. Nothing should be given by mouth.

Post-operative management:

1. Morphia is given to relieve pain or restlessness.

2. Intravenous fluids are given for the first 24 hours and then fluids by mouth. Liquid diet is given for 3 days, thereafter followed by a soft diet on the 4th day.

3. Enema is given on the 3rd day (small glycerine enema).

4. Antibiotics are given from the day of operation.

If a drainage tube has been inserted in the appendicular region, it should be retained for 48 hours and then gradually removed, depending upon the amount of drainage.

Skin sutures are removed on the 8th day.

If the patient has an *appendicular abscess,*—

1. Drainage of the abscess should be done.

2. Wangenstein's suction is employed to decompress the intestines, as there is usually a mild paralytic ileus.

3. Fluid must be given parenterally along with Vitamins.

4. Blood transfusion, if necessary.

5. Chemotherapy or antibiotics like Penicillin and Streptomycin to be given from the 1st day.

6. The drainage tube should not be removed till all the pus has drained out which usually takes about 7-10 days. The drainage tube may be shortened as the discharge becomes less and less.

7. Skin sutures are removed about the 9th day.

The complications that occur after Acute Appendicitis are as follows:—

1. Distension of intestines or paralytic ileus which is treated by continuous suction through a Miller Abbott tube with the help of Wangenstein suction apparatus.

2. Pelvic abscess:—This is drained through the rectum or vagina.

3. Stitch infection treated by antibiotics.

4. Subdiaphragmatic abscess (treatment has been outlined under that heading).

Perforated Duodenal Ulcer and Acute Intestinal Obstruction

The investigations are:

1. Haemoglobin percentage estimation.

2. Urine examination.

3. Plain X-ray of abdomen with patient in the erect posture. In cases of acute intestinal obstruction, the fluid

FIG. 53 (b) Plain X-ray of Abdomen with patient in the erect posture showing fluid levels due to Intestinal Obstruction. A Miller Abbott tube is passed to decompress the intestines before operation

levels will be seen. In cases of perforated duodenal ulcer, there will be gas underneath the right dome of the diaphragm.

Pre-operative treatment:

1. Shock is treated by giving patient 5% glucose in water or saline intravenously and relieving his pain by giving him morphia.
2. Nothing is given by mouth.
3. No enema is given in cases of duodenal perforation. In cases of intestinal obstruction, a two enema test is done and the patient carefully watched to find out if he is passing any flatus after the enema.
4. Patient is started on Terramycin or Aureomycin; if not available, Penicillin and Streptomycin.

Post-operative management:

1. Shock and fluid loss are corrected by blood transfusion, saline or plasma or any of the plasma substitutes.
2. Patients should have Terramycin intravenously about 1000 mgms by drip method for the first 24 hours; and thereafter, the dosage can be reduced gradually. If Terramycin is not available, Penicillin, 1 million units, and 2 gms. of Streptomycin should be given daily for the first three days
3. Suction syphonage through a Ryle's tube is absolutely essential in these cases to prevent distension and paralytic ileus
4. A fluid chart is maintained and, depending upon his blood chemistry, fluids are given intravenously.
5. The drainage tube left in the Morrison's pouch is removed on the 3rd or 4th day.

Penetrating Injury of Abdomen

The *pre-operative* measures are:

1. Pain is relieved by giving morphia.
2. Fluids are given in the form of glucose or saline transfusion which can be changed on to blood during the

operation; but, if the patient has lost blood due to the injury, blood transfusion should be started immediately.

3. A Ryle's tube is passed and the contents of the stomach are aspirated.

4. Preparation of abdomen can be done in the operating room after the patient has been anaesthetised.

5. During the operation, Penicillin and Streptomycin are mixed up and kept ready for instillation into the peritoneal cavity.

The post-operative management is the same as in any other case of abdominal emergency.

Ectopic Gestation

A careful history, the severe anaemia, sudden and acute pain in the lower abdomen followed by fainting with a history of missed period, should arouse the suspicion of a ruptured ectopic. If still in doubt, the following investigations are done:

1. W.B.C. count which will be high.
2. B.S.R.—a rising B.S.R. is present in these cases.
3. Vandenbergh reaction: If the patient had repeated attacks of internal bleeding, a rising Vandenbergh reaction will be noted.
4. Posterior colpocentesis would clinch the diagnosis, if fresh blood is drawn.

An immediate operation is indicated under such circumstances. Roughly, about 900 c.c. of blood should be available for transfusion. The blood should be running in, when the peritoneum is being opened. If necessary, the blood should be pumped in as quickly as possible to meet the sudden fall of blood pressure that occurs in these cases. The blood in the peritoneal cavity can also be used for auto-haemo-transfusion in these cases. For this, 3% sodium citrate solution should be ready so that the blood that is removed from the peritoneal cavity by swabs can be mixed with citrate solution. This is then filtered and given intravenously.

levels will be seen. In cases of perforated duodenal ulcer, there will be gas underneath the right dome of the diaphragm.

Pre-operative treatment:

1. Shock is treated by giving patient 5% glucose in water or saline intravenously and relieving his pain by giving him morphia.
2. Nothing is given by mouth.
3. No enema is given in cases of duodenal perforation. In cases of intestinal obstruction, a two enema test is done and the patient carefully watched to find out if he is passing any flatus after the enema.
4. Patient is started on Terramycin or Aureomycin; if not available, Penicillin and Streptomycin.

Post-operative management:

1. Shock and fluid loss are corrected by blood transfusion, saline or plasma or any of the plasma substitutes.
2. Patients should have Terramycin intravenously about 1000 mgms by drip method for the first 24 hours; and thereafter, the dosage can be reduced gradually. If Terramycin is not available, Penicillin, 1 million units, and 2 gms. of Streptomycin should be given daily for the first three days.
3. Suction syphonage through a Ryle's tube is absolutely essential in these cases to prevent distension and paralytic ileus.
4. A fluid chart is maintained and, depending upon his blood chemistry, fluids are given intravenously.
5. The drainage tube left in the Morrison's pouch is removed on the 3rd or 4th day.

Penetrating Injury of Abdomen

The *pre-operative* measures are:

1. Pain is relieved by giving morphia.
2. Fluids are given in the form of glucose or saline transfusion which can be changed on to blood during the

(b) Blood transfusion is very useful to combat shock.

(c) Antibiotics and chemotherapeutic drugs are very helpful in controlling the infection. Aureomycin or Terramycin intravenous drip is very useful in severe peritonitis. If the above two drugs are not available, the next best is Penicillin and Streptomycin.

(d) Morphia may be liberally administered to these patients in doses of $\frac{1}{6}$—$\frac{1}{4}$ gr. at intervals of 4 to 6 hours.

(e) The peritoneal cavity may be drained by a drainage tube or a Penrose drain. These tubes are left in position for 24 to 48 hours depending upon the amount of discharge from the *peritoneal cavity. If the drainage tube is left in* contact with hollow viscera like caecum or small bowel for a long time, a fistula may occur due to pressure necrosis of the wall of the bowel by the tube and hence it is shortened after 48 hours.

In cases of peritoneal abscesses, the drainage has to be continued for a longer period and it is safer to use a Penrose drain.

(f) *Position of the patient.* The old fashioned Fowler's position is no longer adopted. The patient usually lies flat in bed for the first 24 hours and later on, the head may be supported by pillows. The routine practice of adopting Fowler's position is undesirable for it bends the patient at his hips and knees and predisposes to venous thrombosis in the lower extremities. In early cases of peritonitis however, Fowler's position may be of some advantage as it may help the infected fluid in the peritoneal cavity to settle in the pelvic cavity.

The post-operative complications that are likely to occur in these cases are : —

1. Lung complications,
2. Burst abdomen,
3. Parotitis.

These are treated on the lines mentioned in the respective chapters.

The post-operative management is the same as for any other case of acute abdomen.

Peritonitis

Infection may reach the peritoneal cavity by many routes: —

1. Infective or perforative lesions of the intra-peritoneal viscera.
2. Directly from an abdominal wound (penetrating injuries of the abdominal wall).
3. After operations on the abdominal viscera like the intestines, colon or gall bladder.
4. Infection from the thorax may reach the peritoneal cavity through the lymphatics.
5. Blood stream infections.
6. Infection may reach the peritoneal cavity from the exterior through the genital tract in females.

The *treatment* for these cases would be:

1. to remove the focus of infection as in cases of appendicitis, cholecystitis or perforations of the intestinal tract:
2. to localise the infection in cases where the focus of infection cannot be removed or in cases where it has already been removed by operation.

The *post-operative* instructions are: —

(a) Nutrition of the patient is maintained by continuous intravenous infusion of 5 % glucose in distilled water or saline. Nothing is given by mouth till the bowel movements *have started and patient passes flatus. Distension of the* intestines is prevented by passing a Ryle's tube or a Miller Abbott tube and thus decompressing the bowel. This continuous suction syphonage is maintained till the stomach and intestines have regained their normal tone.

Intake and output charts are maintained and the patient is given the necessary amount of Vitamins daily.

checked and appropriate fluid therapy must be continued. As soon as the blood chlorides return to normal, saline infusion is stopped and patient is given 5 % glucose in distilled water. Intake and output chart should be maintained and total amount of 2000 c.c. may have to be given in 24 hours every day to correct the dehydration. Parenteral preparations of Vitamin C, 500 mgms and Vitamin B are given till the patient is able to take fluids by mouth. The suction syphonage must be continued till the tone of the stomach returns to normal which can be noted by giving the patient small amounts of plain water by mouth and clamping the Ryle's tube for 2 or 3 hours. If aspiration is done after 3 hours and one finds that very little comes out and the fluid is just colourness, it means that there is no stasis in the upper part of the intestinal tract and that the gastric motility has returned to normal. Then the Ryle's tube is removed and the patient is given small amounts of fluid by mouth every hour and the parenteral therapy also is discontinued after 24 hours

Abdominal Wound Disruption

Burst abdomen is a grave and tragic complication and may occur at any age following an abdominal operation. Disruption of the abdominal wound may be partial when all the other layers have given way except the skin or peritoneum. It is complete when all the layers of the wound have given way and the abdominal contents come out. There are many factors which may be responsible for poor wound healing and wound disruption. Factors which are present before operation may continue to exert their influence during the post-operative period if they are not recognised and corrected before surgical intervention.

1. Age: Age does not play a part and wound disruption has occurred in the very young and in the old patients.

2. Sex: This also does not play any important part in wound disruption.

3. Nutritional status of the patient: Malnutrition, dehydration, anaemia, hypoproteinaemia and Vitamin deficiencies play a definite role in the post-operative period and are

Acute Dilatation of Stomach

Acute dilatation of stomach is a condition where there is an accumulation of fluid and gas in the stomach due to a paresis or a paralytic ileus involving the stomach wall. The stomach becomes enormously dilated and the patient has severe regurgitant vomiting which is followed by dehydration and tetany. Later the patient becomes delirious and comatose and if no treatment is given, death ensues. This condition of acute dilatation of stomach may occur as a post-operative complication, more particularly in operations on the pelvic viscera, gall bladder, biliary passages, appendix or stomach. This has sometimes occurred after operations on the genito-urinary tract like prostatectomy or nephrectomy. The other conditions in which acute dilatation occurs are after child birth, after acute illnesses like pneumonia, typhoid or when patients are recovering from septicaemia.

This usually starts 36 hours after operation and the prominent signs are abdominal distension, regurgitant vomiting, toxaemia and collapse The fluid that wells up into the mouth and spills over the lips is brownish green or blackish in color and has a very peculiar odour. The vomiting is never projectile, the patient rapidly becomes dehydrated and the pulse becomes rapid, weak and imperceptible. Temperature becomes subnormal and hiccough sets in soon. Patient has an anxious expression with eyes sunken and is exhausted although his mind is alert till the end.

A rising pulse rate with regurgitant vomiting of greenish or blackish material after any major surgical procedure is suggestive of this condition.

Treatment:

1. A Ryle's tube is passed into the stomach and connected to a Wangenstein's suction syphonage apparatus. All the toxic gastric and duodenal contents and gas are quickly removed by this method.

2. Dehydration, hypoproteinaemia, toxaemia and alkalosis should be corrected by intravenous glucose saline or glucose and distilled water. The blood chemistry must be

Symptoms and Signs:

When the wound bursts, the patient experiences a sharp pain and immediately complains that something has given way over the wound. The pulse rate rises and the dressings over the wound become stained with blood. On lifting the dressings, coils of intestine may be found protruding through the separated edges of the abdominal incision. Even in cases where the skin incision has not given way and there is a copious discharge of a sero-sanguinous material, the possibility of wound disruption should be thought of.

Prevention:

If the nutritional state of the patient has been corrected, if hypovitaminosis and anaemia are treated, if care is taken to see that the patient has no cough and vomiting, if the surgical technique employed has been perfect and if the post-operative therapy has been careful, then the chances of a burst abdomen occurring in these patients will be negligible.

Treatment:

The surgeon faced with this wound disaster must decide immediately the method of treatment to be adopted.

Morphia should be given to prevent shock and blood transfusion or intravenous fluids started. The wound should be covered with warm saline soaked pads and a sterile binder applied over this The choice of an anaesthetic agent depends upon the patient's condition. After closure of the wound by through and through sutures of heavy silk or steel wire, the skin edges are approximated by silk sutures. During the post-operative period, peritonitis is combatted by antibiotics, abdominal distension by decompression of the intestines and fluid imbalance by parenteral alimentation. The skin sutures may be removed on the 9th or 10th day and the tension sutures on the 13th or 14th day. If the skin incision alone has given way, adhesive strips may be used to bring the wound edges into perfect apposition. The patient must wear an abdominal corset after the wound has healed to prevent the late complication of an incisional hernia. He should be kept in bed at least for three weeks before being discharged.

responsible for delayed wound healing or wound disruption. Wound disruption often occurs in patients with gastrointestinal cancer. This has been thought to be due to hypoproteinaemia rather than due to cancer. Hypoproteinaemia therefore delays wound healing and must be corrected by intravenous infusions of plasma, albumin or blood. Chemical imbalance also is responsible for delayed wound healing. Intravenous fluids administered judiciously will correct the imbalance. Other factors responsible for wound disruption are obesity, diabetes, hepatic disease with jaundice, tuberculosis, syphilis and severe toxaemias.

4. Action of certain drugs on wound healing.

The effect of certain drugs like Heparin and Dicoumerol given in effective therapeutic doses has resulted in delayed wound healing. This has been due to bleeding occurring underneath the incision and thus resulting in a haematoma. When drugs like Cortisone or A.C.T.H are given, they prevent the formation of fibroblasts and are responsible for wound disruption.

5. Post-operative complications like increased intra-abdominal tension play an important part in wound disruption and indeed may be the precipitating factor. The other post-operative complications are acute dilatation of stomach, paralytic ileus of the small intestines, hiccough, meteorism, post-operative vomiting, violent coughing and sneezing, difficulty in defaecation or micturition all of which may play a part in causing wound disruption.

6. Infection. Wound healing is delayed if there is infection and this may be another post-operative complication which may play an important part in causing this accident.

When wound disruption occurs, the causative factors may be:

(a) Too rapid absorption of catgut.

(b) Cutting the sutures close to the knots and especially if they be catgut sutures.

(c) *Sutures cutting through.*

(d) Suppuration and sloughing.

(e) Badly placed abdominal wound incisions.

5. Post-operatively, the patient is kept under an umbrella of Penicillin or chemotherapeutic drugs for 4 or 5 days.

6. If the patient has any distension, it should be relieved in the usual manner and Wangenstein's gastric suction should be instituted.

7. In some cases, a slight swelling of the scrotum or scrotal oedema may be present for which condition, the scrotum should be supported or bandaged.

8. An enema is given on the 3rd day after operation and repeated thereafter, if necessary.

9. Patients may also get slight difficulty in micturition for the first two days and this can be relieved by catheterisation.

10. The skin sutures are removed on the 8th day.

Umbilical Hernia

Umbilical Hernias are extremely common in infants and they usually disappear spontaneously. During the first 6 months of childhood, strapping is done with or without pads to reduce the Hernia. The infant should not be allowed to strain during defacation and any respiratory catarrh or cough should be treated. It is also essential to see that the child does not cry often due to pain or due to any disorder of intestinal function. Rubber trusses to reduce an umbilical hernia are very unsatisfactory. If the hernia continues to increase in size the routine pre-operative preparation and medication are given before undertaking operation. In adults, umbilical hernia is common in women. It becomes steadily larger as a result of child-bearing and obesity. If untreated, intestinal obstruction and strangulation may occur. The only treatment is operative and in the absence of contra-indications, this should be undertaken as early as possible. Almost the only absolute contra-indication is, a hernia so large that the abdominal cavity either cannot accommodate the contents or can only do so at the expense of serious respiratory embrassment. These patients usually have cough and are very obese. Some of them may be diabetic and hence careful pre-operative

CHAPTER 22

HERNIA

The *pre-operative* investigations for a case of Hernia are :—

1. Blood examination.
2. Blood pressure and if patient is old an E.C.G. is done.
3. Urine examination.

If the patient is past the age of 40, his blood urea is estimated and residual urine noted.

X-ray of the chest is done to detect any lesions of the lung or heart. Bleeding time, coagulation time and serum proteins are determined if indicated.

Rectal examination should be done to find out if there is any prostatic enlargement. If the patient has any difficulty in passing urine, a rubber catheter is passed to ascertain the presence of any stricture and to note the quantity of residual urine

Preparation of the patient consists in :—

1. Enema the previous night and on the morning of operation.
2. Part to be prepared in the usual manner.
3. Giving him a bed coffee and nothing after that.

Post-operative care will be on the following lines :—

1. Morphia at night to relieve the pain.
2. Deep breathing exercises should be instituted to prevent any lung complications.
3. If the patient has been operated under spinal anaesthesia, the foot of the bed should be kept raised for about 8 hours.
4. Fluids can be given orally in the evening after the operation, semi-solid diet on the 2nd day and a normal diet on the 4th or 5th day after operation.

then reconstituting the abdominal wall, so as to restore a normal anatomy. In some cases, fascia lata may have to be used in effecting the repair. In others where there is considerable loss of tissue from sloughing due to infection of the original operative wound, some surgeons use either stainless steel gauze or tantallum gauze to cover the defect.

The usual post-operative treatment mentioned above should be carried out in these cases also.

Diaphragmatic Hernia

In this condition the abdominal contents have passed into the thoracic cavity through an abnormal opening in the diaphragm which may be due to a congenital defect in the diaphragm or in some cases due to rupture or necrosis of the normal diaphragm. The severity of the symptoms depends upon the number of abdominal viscera which are displaced into the thorax and also on the extent to which the lungs have been collapsed.

The symptoms are complex and may vary from a slight interference with the function of the abdominal viscera which has got herniated, to a severe degree of interference with respiration and circulation as a result of increased pressure on the lungs and heart by the herniated abdominal viscera.

The following investigations are usually done for the diagnosis.

1. Barium swallow and screening.
2. Barium meal series (Films being taken in the Trendelenburg position to determine the size and the nature of the gut that has herniated).
3. Oesophagoscopy.
4. Pneumoperitoneum: This will help to differentiate eventration from a true hernia.
5. Intravenous pyelography to find out whether the kidney has also got displaced into the thoracic cavity along with the other abdominal viscera.
6. Routine blood examination.

treatment is necessary before operation. The usual investigations mentioned under the Chapter on Hernia are carried out, special attention being paid to the condition of the heart, lungs and renal function. Operation should be deferred until all the systems have been investigated and efficiently treated.

Pre-operative preparation:

1. Skin over the abdomen is prepared in the usual manner.
2. The thighs are also prepared if the repair is to be done with fascia-lata.
3. Pre-anaesthetic medication after consulting the anaesthetist.

Post-operative treatment:

Certain points in the after treatment deserve special attention.

1. Respiratory embarassment and lung complications.
2. Abdominal distension — this should be corrected by continuous gastric suction.
3. Deep breathing exercises are encouraged.
4. Adhesive strapping to the abdomen to prevent any tension at the suture line.
5. Antibiotics to prevent any wound infection.

Incisional Hernia

Incisional Hernia is a frequent late complication of abdominal Surgery It usually occurs due to infection in the post-operative period Sometimes it may occur due to partial wound disruption which may be recognised by the discharge of blood or serosanguineous fluid, from the wound. Sometimes it may also occur in obese individuals who have lung complications in the post-operative period. Another common cause of incisional Hernia is, when the patient is hypoproteinaemic and poorly nourished. The usual preoperative investigations mentioned above are carried out.

The operative treatment consists in dissecting free the muscular and fascial components of the abdominal wall and

(c) over the 3rd piece of the sacrum behind.
(d) Midway between the iliac crest and the upper border of greater trochanter of the opposite side.
(e) Returning to the symphysis pubis.

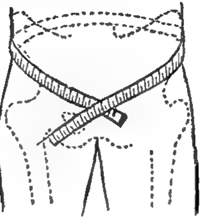
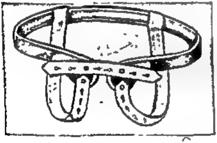
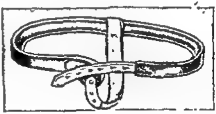


FIG. 54(a) Diagram showing the position of the measuring tape.

The truss should be worn constantly except during sleep.





54(b) 54(c)

FIG. 54(b). Diagram showing the type of double Trusses worn for Bilateral Inguinal Hernia (c) Diagram showing the type of Truss worn for an Indirect Inguinal Hernia.

If the hernia comes out when the patient is in bed a light truss should be worn. During bathing, the patient must wear a rubber covered truss. The patient should wash the hernial site with soap and water every day and dust it with powder before wearing the truss. Care must be taken to prevent any dermatitis or ulceration.

The pre-operative preparation will be similar to any major abdominal surgery.

The operation can be done either through the abdominal or thoracic route.

In the post-operative period, care must be taken to combat shock, paralytic ileus and tension penumothorax. In some cases effusion may occur in the pleural cavity which may have to be treated by repeated aspiration. When the gap is wide in the diaphragm, the hernia is approached through the thoracic route and post-operative effusion in the pleural cavity is treated by draining the pleural cavity through a rubber tube which is connected to a water seal.

Measurements and particulars required for a Truss

A truss is prescribed to patients who are very old and where operative treatment is contra-indicated. It is also given to patients who are bad risks for surgery due to diseases of the heart, lungs and kidneys.

A truss can be fitted only to a reducible hernia. Its essentials are that it should be of reasonable price, hard-wearing, comfortable, relatively water-proof and control completely the hernial apperture so that contents cannot enter the sac.

When a truss is ordered, the following information should be given to the instrument-maker :—

(a) Type of hernia — Inguinal, femoral or umbilical.
(b) In the case of femoral and inguinal whether the hernia is on the right side, left side or double.
(c) Age.
(d) Sex.
(e) Occupation of the patient.
(f) Measurement for a truss.

The patient should be in the recumbent position and the measuring tape passed over the following points :—

(a) Starting at symphysis pubis
(b) midway between the crest of the ileum and upper border of the greater trochanter,

operatively shortens the convalescence in the post-operative period.

The other systems like the cardio-vascular, renal, nervous and gastro-intestinal, should be examined before submitting her to operation. X-ray of the chest and bones are taken to find out if there is any secondary deposit in cases of suspected malignancy.

The hypoproteinaemia, hypovitaminosis and dehydration should be corrected in these cases before radical surgery is done. Besides, a routine examination of the urine, in cases where infection of the urinary tract is suspected, a catheter specimen of urine should be sent for bacteriological examination.

Rectal examination is necessary to find out the tone of the sphincter, especially in cases of perineal tear. If the patient is having a vesico-vaginal fistula, cystoscopy will be of help to find out the position of the fistulous opening.

Intravenous and retrograde pyelography may have to be done in cases of vesico-vaginal or uretero-vaginal fistulas. In cases of large tumours of the ovary, uterus and its adnexa, retrograde prelography will be of help to note the exact position of the ureters and the degree of renal damage. In cases of cancer of the uterus where pelvic exenteration is to be done, ureteric catheters are passed up the ureters to note their exact positions This method helps the surgeon to identify the ureters quickly while doing the radical procedure.

Preparation of the patient before the operation consists in:

1. Preparing the abdomen and perineum.

2. Soap and water enema should be given morning and night preceding the operation.

3. Dettol douche should be given once or twice every day till the day of operation, depending on the nature of the vaginal discharge or infection that is present.

4. The patient is given a barbiturate the previous night to promote sleep.

5. Nothing should be given by mouth for six hours prior to surgery.

CHAPTER 23

GYNAECOLOGY

Every gynaecological patient admitted to the hospital should have a complete investigation done before she is submitted to any operation. The gynaecological operations are divided into two groups, pelvic and abdominal operations. When the operation is to be done by the abdominal route, the preparation of these patients will be the same as for any major abdominal operation. These patients must have a complete examination done which consists in examining the external genitalia for any infections, new growths or cysts: A careful examination of the vagina to find out if there is any perineal tear, cystocele or rectocele; examination of the cervix to find out if there are any erosions, growths or polyps; examination of the fornices, especially the posterior fornix, to find out if there is any pelvic abscess or neoplasm; lastly, a bimanual examination of the uterus and its adnexa to find out the size, position, mobility and consistency of the uterus as well as any abnormalities of the adnexa. If there is any discharge, it should be examined and nature of organisms responsible for it should be found out. In some cases of pelvic abscess or ectopic pregnancy, a posterior colpotomy or needling of the cul de sac will confirm the diagnosis. The vaginal mucosa undergoes a lot of changes during the reproductive *life of the individual and the superficial, squamous* epithelium lining the vagina shows changes when there is a hormonal imbalance. If frequent smears are taken during the cycle, a fair estimate of the patient's ovarian function can be made.

The anaemia that occurs in these cases due to either a fibroid of the uterus, cancer of the ovaries or uterus and pelvic inflammations should be treated and the Haemoglobin level raised to at least 75% before the patient can be operated. It is therefore advisable to give a pre-operative blood transfusion if the Haemoglobin level is not satisfactory. Combatting anaemia and improving the general condition pre-

(g) Solid foods are given after the patient has had a good result following an enema.

The same pre-operative and post-operative treatment is adopted for cases of Salpingectomies, Salpingostomies and Oopherectomies.

Late complications in the post-operative period will be:

1. Retention of urine;
2. Thrombosis or Thrombophlebitis.
3. In patients who have cystitis, bladder washes will have to be given. If there is a bladder infection, irrigation with Acriflavine 1 in 10,000 solution or 1 in 8,000 Mercury Oxycyanide solution should be used. The infection gets controlled by Sulphonamides and in some by Streptomycin or Aureomycin.
4. In some cases, anuria has followed after total or sub total hysterectomy. This complication may occur due to the ureters being damaged at the time of operation or due to the failure of kidney function. This is diagnosed by cystoscopic examination and ureteral catheterisation.
5. The most important late complication is Thrombosis of the popliteal veins or veins in the leg. The patient should be examined and she must be asked to move her limb and change her position from side to side to prevent this complication. Deep breathing exercise is encouraged and in some clinics, early ambulation is advised after these major operations. If thrombosis has occurred, a consultation with a medical colleague is essential and anticoagulants like Heparin or Dicoumarol or Tromexan may have to be given. In some clinics, a prophylactic bilateral ligation of the superficial femoral vein is done as a routine. In the tropics, this complication is not common.

Dilatation and Curettage

Dilatation and Curettage of the Uterus: The pubic region and the perineum are shaved; a dettol douche is given the previous day and on the morning of the operation; enema, the previous night of the operation; and the bladder emptied immediately before the operation.

6. Pre-anaesthetic medication after consulting the anaesthetist.

7. Just before the operation, the bladder should always be catheterised.

8. Antibiotics like Penicillin or Streptomycin may be given to eradicate any infection before operation.

In cases where Total or Sub-Total Hysterectomies are done through the abdominal route, it is desirable to swab the vagina with an antiseptic such as Acriflavine and plug it with Acriflavine gauze. This gauze is removed just before the operation.

Hysterectomy

Pre-operative measures:

1. It is desirable that the patient is hospitalised a week before the date of operation.

2. Skin of the abdomen and external genitalia must be shaved and prepared for operation in the usual manner.

Post-operative care:

(a) Shock after this major operation is treated by the usual methods such as blood, plasma or saline transfusion.

(b) Pain is relieved by giving morphia or omnopon.

(c) Catheterisation of bladder should be done 8-10 hours after the operation.

(d) Intestinal distension is not infrequent and can be relieved by the use of Prostigmine, every 6 or 8 hours, combined with a little Calcium Pantothenate. Just before giving these injections, it is desirable to pass a rectal tube and leave it in situ

On the 3rd day after operation, an enema is given

(e) Vomiting may be present for the first 24 hours and fluids are given parenterally during this period. If the vomiting is still present or if there is acute dilatation of the stomach or intestinal distension, a Ryle's tube is passed into the stomach and a Wangenstein suction syphonage is instituted and the intake and output recorded.

(f) Infection in the post-operative period is controlled by giving antibiotics or chemotherapeutic drugs.

(g) Solid foods are given after the patient has had a good result following an enema.

The same pre-operative and post-operative treatment is adopted for cases of Salpingectomies, Salpingostomies and Oopherectomies.

Late complications in the post-operative period will be:

1. Retention of urine;
2. Thrombosis or Thrombophlebitis.
3. In patients who have cystitis, bladder washes will have to be given. If there is a bladder infection, irrigation with Acriflavine 1 in 10,000 solution or 1 in 8,000 Mercury Oxycyanide solution should be used. The infection gets controlled by Sulphonamides and in some by Streptomycin or Aureomycin.
4. In some cases, anuria has followed after total or sub total hysterectomy. This complication may occur due to the ureters being damaged at the time of operation or due to the failure of kidney function. This is diagnosed by cystoscopic examination and ureteral catheterisation.
5. The most important late complication is Thrombosis of the popliteal veins or veins in the leg. The patient should be examined and she must be asked to move her limb and change her position from side to side to prevent this complication. Deep breathing exercise is encouraged and in some clinics, early ambulation is advised after these major operations. If thrombosis has occurred, a consultation with a medical colleague is essential and anticoagulants like Heparin or Dicoumarol or Tromexan may have to be given. In some clinics, a prophylactic bilateral ligation of the superficial femoral vein is done as a routine. In the tropics, this complication is not common.

Dilatation and Curettage

Dilatation and Curettage of the Uterus: The pubic region and the perineum are shaved; a dettol douche is given the previous day and on the morning of the operation; enema, the previous night of the operation; and the bladder emptied immediately before the operation.

After the operation, the patient rests in bed for a couple of days and is discharged on the 3rd or 4th day. After every act of micturition or defaecation, a dettol wash of the vulva and perineum should be done.

Perineorrhaphy and Fothergill Operation

1. The patient must be in bed for a day or two before the operation.

2. The pubic region should be shaved and the part should be washed with ether soap and warm water and a sterile dressing applied which is held in position by a bandage.

Antiseptics like Acriflavine in spirit or rectified spirit are to be applied only when the patient is on the operating table. Douching with dettol, a teaspoonful to a pint, is necessary in those cases where there is a foul discharge.

Patient is kept under an umbrella of antibiotics before any vaginal operation.

Bowels: Patient is given an aperient a couple of days before operation or a soap water enema morning and evening on the previous day of operation. No enema should be given on the morning of the operation as the patient may have a bowel movement when she is under the influence of an anaesthetic.

The bladder should be emptied immediately before the operation.

Diet: Patient should have ordinary diet during lunch time and a light diet the night before operation and nothing is taken in the morning of the operation when it is performed in the forenoon.

Post-operative care:

1. At the completion of the operation, an indwelling catheter is left in the bladder for 5 to 6 days and connected to a bottle containing some antiseptic fluid.

2. Patient is kept on liquid diet for 5 or 6 days.

3. Pain is relieved by giving the patient Omnopon once or twice daily.

4. Suture line should be dusted with Penicillin or Sulphanilamide powder and kept always dry.

5. On the 5th day, the bowels are allowed to be moved by giving the patient a small glycerine enema. The nurse should exercise great care in seeing that the suture line does not get contaminated during defaecation.

6. In vaginal operations, if packing has been used to control any oozing, it is removed 12 to 24 hours after operation. Its withdrawal must be done very gently to minimise pain.

Catgut sutures in the vulva, perineum or vagina should be left to separate by themselves. Skin sutures should be removed on the 5th day.

Patient usually has a mild vaginal discharge after a colporrhaphy or amputation of the cervix and this starts usually about the end of 2nd or 3rd week.

A gentle douching of the vagina with a mild antiseptic may be given once a day after the third week.

Weak antiseptic solution like Flavine 1 in 1000 or Dettol 1 drachm to a pint is used for gentle irrigation.

The patient is allowed to sit up in bed on the 10th or 11th day and is allowed to walk about on the 13th or 14th day and discharged on the 16th day.

The diet in these cases should be semi-solid after the bowels have moved and a normal diet is given on the 8th or 9th day after the operation.

Vaginal Hysterectomy

Vaginal Hysterectomy is now performed more frequently for several pathological conditions of the uterus. The preoperative preparation is the same as for any vaginal operation.

In the post-operative period, the patient has an indwelling catheter in the bladder for 8 days. The healing of the perineal wound will be facilitated by keeping the part dry and dusting it with Penicillin or Sulphanilamide powder.

No douching is done at all.

The bowels are usually moved on the 5th day by a soap and water enema.

The patient has a course of chemotherapy or antibiotics and the post-operative pain is relieved by barbiturates or morphia.

Vesico-Vaginal Fistula

The success of this operation depends upon the care that is taken during the post-operative period. This condition usually occurs due to injuries to the bladder during child birth. After the closure of the fistulous opening, the bladder must be drained.

The bladder is kept empty by connecting the indwelling catheter to a continuous suction apparatus.

The *post-operative care* following any vaginal operation is as follows.

1. Pulse and respiration recorded every hour and temperature every 4 hours.

2. Blood pressure noted twice or thrice a day or more often if the patient is in a state of shock.

3. Diet. Fluids are administered orally, after nausea or vomiting has ceased. Till then, the patient is given fluids parenterally The diet is increased to soft food on the 4th day except in cases of complete tear of the perineum or after repair of a rectovaginal fistula, when the liquid diet is continued for 6 days.

The liquids usually given are coffee without milk or cream, tea, soup and orange juice.

4. *Pain is relieved by omnopon or morphia which may* be repeated every 12 hours. In some cases, patient may be given Barbiturates to give the necessary sedation instead of morphia.

5. Care of the bowels. Patients are given liquid paraffin, one oz., at bed time on the 3rd day and a glycerine enema on the following morning In cases where the patient has had a repair for a complete tear of the perineum, 1 oz. of

liquid paraffin is given at bed time on the 6th day and on the 7th day, a glycerine or olive oil enema is given. After the bowels have moved, a soft solid diet is permitted for these patients.

6. Care of the bladder. The patient's bladder must be catheterised every 8 hours and in cases of repair of the perineum or in cases of vesico-vaginal fistula, an indwelling catheter of the Foley type is employed for continuous drainage. Sometimes, a suction apparatus is connected to the catheter to keep the bladder empty.

Recently, a new drug Nitrofurantoin (Furadantin) has been used in the treatment of urinary infections. Nitrofurantoin has a wide spectrum of anti-bacterial activity against both Gram positive and Gram negative organisms. It is designed specifically for the treatment of bacterial infections of the urinary tract. The drug is indicated in pyelitis, pyelonephritis and cystitis where severe renal damage is not present. Bacteria sensitive to Furadantin include such refractory species as Escherichia coli, Proteus, Pseudomonas and Aerobacter species. Following oral administration, approximately 40 per cent of the drug is excreted in the urine. Its solubility in urine obviates the danger of crystalluria. Furadantin is also available as an intravenous solution and is rapidly effective in systemic infections such as septicaemias, peritonitis and other bacterial infections as of post-operative wounds and abscesses. The intravenous solution can be given in severe genito-urinary tract infections when the patient is unable to take Furadantin by mouth. When other antibiotics have not proved successful, Furadantin can be given both as a pre-operative and post-operative medicament to sterilise the genito-urinary tract.

CHAPTER 24

SURGERY OF THE BREAST

Radical Mastectomy

The following investigations are necessary before a radical mastectomy is done.

1. Blood examination,

2. Urine examination,

3. Examination of the nipple discharge.

4. X-Ray of the lungs, long bones and spine for evidence of any metastasis in cases of suspected malignancy.

5. Serum acid phosphatase,

6. Bleeding time, coagulation time and prothrombin time,

7. Blood urea.

8. Serum proteins.

9. If the patient is having sugar in the urine, blood sugar tolerance is done.

10. A complete examination of the cardio-vascular and respiratory systems by the physician and an E.C.G. if necessary.

11. If the patient complains of pain in any part of the body, this should be thoroughly investigated by clinical examination and X-Rays to rule out the possibility of secondaries.

12. Rectal and vaginal examination.

Pre-operative treatment consists in correcting:

(a) the anaemia by one or two blood transfusions at intervals of [illegible] or 3 days;

(b) hypoproteinaemia by giving Protein Hydrolysate preparation; and

(c) hypovitaminosis by giving daily injections of vitamins.

On the night before operation, instructions to be given are:—

1. Light dinner at bed time. At 5 A.M. on the morning of operation, the patient may have a cup of coffee but breakfast is omitted.

2. Enema in the morning.

3. Abdomen, chest, axilla and arm to be prepared for operation and thighs to be prepared for skin grafting, if necessary.

About 600-750 c.c. of blood should be available at the time of Operation. In cases of doubt, whether the tumour is malignant or not, the pathologist should be informed so that he may be available to do a frozen section at the time of operation and to report thereon.

Post-operative treatment:

1. For relief of pain, an injection of Omnopon or Morphia, 1/4 gr. is given This may be repeated after eight hours if necessary. Barbiturates may be given in some cases.

2. Deep breathing exercises after operation and oxygen inhalation to prevent post-operative lung complications such as atelectasis.

3. The arm on the side of the operation should be kept in an abducted position.

4. Nothing is given by mouth till the patient has recovered from anaesthesia.

5. Fluids in the form of 5% dextrose in water are given intravenously after the blood transfusion is over.

6. Patient can be given liquid diet on the 1st and 2nd day and semi-solid diet on the 3rd and normal diet on the 7th day.

7. The blood pressure should be watched carefully every half or one hour for the first 24-48 hours.

8. The dressings should be watched to find out if there is any severe bleeding. These may have to be changed on the 2nd or 3rd day or earlier if they are soiled.

9. Drainage tube can be removed on the 4th or 5th day. The skin sutures are removed on the 11th or 12th day. Post-operatively for the first 5 or [illegible] days, patient is given Penicillin and Streptomycin.

CHAPTER 25

THORACIC SURGERY

Lobectomies and Pneumonectomies

Pulmonary resection is an elective procedure in most cases and the patient must be brought to the best possible physical state before the operation is undertaken.

The investigations are:—

1. Blood examination and the estimation of Hb. in grams.
2. Total proteins, albumin and globulin ratio.
3. Blood urea.
4. Bleeding time, coagulation time and prothrombin time.
5. Blood group of the patient.
6. Urine examination.
7. Examination of sputum for A.F.B. or malignant cells.
8. In the case of tuberculosis, *B. S. R.*
9. Vital capacity.
10. X-Ray chest—A.P. and lateral views.
11. Bronchogram.
12. Bronchoscopy and, if the patient has a growth, biopsy of the growth.
13. Liver function tests, if necessary.
14. X-Ray of bones to exclude any metastasis.
15. Examination of the cardio-vascular system by a physician and, if necessary, an E.C.G.

Pre-operative treatment:

1. A diet rich in carbohydrates and proteins should be given supplemented with vitamins and iron.

FIG 55. Bronchogram Right side shows normal filling and left side shows Bronchiectasis.

2. Intravenous administration of amino-acids or plasma will restore the blood proteins to the normal level.

3. Anaemia is corrected either by iron and liver extract or blood transfusion or both.

4. In cases of bronchiectasis or lung abscess or infection superimposed on cancer, chemotherapeutic drugs have been of great service to reduce the severity of infection prior to resection. Antibiotics also have proved to be very effective and helpful. Penicillin and Streptomycin are the best. Penicillin is usually inhaled, about 20,000 units dissolved in ½—1 c.c. of normal saline being used. The inhaled penicillin clears the infection in the respiratory tract.

5. The bronchial secretions should be reduced to a minimum and the patient should arrive in the operating room with the lungs as dry as possible. If the patient is still having much sputum, foot of the bed is raised so that postural drainage is instituted. If the posterior basal segments are affected the patient must lie in the prone position. Thus the patient's position can be changed depending upon the segments affected.

A sputum chart should be maintained and the amount of sputum collected will give an indication as to how the patient is progressing. If the patient is having very thick sputum bronchoscopic aspiration should be repeatedly done.

6. Oral infection must be cleared.

7. The patient must have complete rest in the hospital for 2 to 3 weeks before surgery.

8. In some cases, artificial pneumothorax is induced about 10 to 20 days before operation. The advantage of this procedure is that some degree of cardio-respiratory compensation occurs before surgery. In many cases, it is not possible to secure an adequate collapse because of adhesions.

Pre-operative instructions are:

1. Nothing by mouth after the last meal at night.

2. Phenobarbitone, 1½ to 2 grains is given at bed-time after consulting the anaesthetist.

3. Enema should be given morning and evening before the operation.

4. Chest, back and axilla are prepared.

5. About 1500-2000 c.c. of blood should be available at the time of operation.

6. Bronchoscope should be ready for aspiration if necessary.

7. Premedication to be given in the morning after consulting the anaesthetist. Usually, the patient is given 2 grs. of Nembutal 2 hours before operation and Morphia 1/6 gr.

and Scopolamine 1/150 gr. 1 hour before he is taken to the operating room.

8. Penicillin and Streptomycin 1 gm. should be available for instilling into the pleural cavity.

9. The water seal bottle and its connections must be sterilised and kept ready in the operating room.

10 After the patient is placed on the operating table, under local anaesthesia, the long saphenous vein is exposed just above the ankle on one side and 5% glucose saline is allowed to run into the vein as a slow drip before the operation is commenced.

During the course of the operation, blood transfusion is given instead of saline. In some cases, it may be necessary to expose the veins over both ankles and have the saline or blood run through both veins.

Post-operative treatment consists of the following:—

1. Blood transfusion is followed by saline or 5% glucose in water. In some cases of shock, plasma or plasmosan may be substituted.

2. Antibiotics and chemotherapeutic drugs are given in the post-operative period.

3. The patient may be placed in an oxygen tent or O_2 may be given through a nasal catheter for 24 to 48 hours If the patient's condition is satisfactory, it may be omitted after 12 hours.

4. Liquid diet is started 24 hours after operation and semi-solid diet on the 2nd or 3rd day.

5. Deep breathing exercises and coughing are encouraged to clear the bronchi and to prevent atelectasis or lung complications. The wound should be supported by the Nurse's hands to lessen pain while the patient does deep breathing exercise or when he is urged to cough. The patient must be encouraged to turn from side to side.

6. The catheter draining the pleural cavity should be connected to a water seal bottle. In some clinics, the tube

draining the pleural cavity is connected to a motor suction pump to keep the negative pressure in the pleural cavity at about 8 to 10 cms. of water.

The water seal bottle should always be on the floor. To prevent it from being raised accidentally, some clinics have it suspended from the side of the bed so that it is just above the floor. The glass tube must dip in for about two or three inches of the water in the bottle.

If the bottle is being raised, the drainage tube must be clamped. When the patient is being transferred from the operating room, the tube is clamped so that even if the water seal bottle is raised, it would not affect the patient. If the water seal bottle is suspended from the side of the bed as is done in some clinics, then the clamping of the tube is not necessary.

When the water seal bottle has to be changed because of any block or when it has become more than half full, then the tube should be first clamped and with all aseptic precautions, another water seal bottle must be attached. The water seal bottle must be examined by the nurse several times in the day and night. If the column of water moves up and down with respiration, it denotes that there is no block in the tube.

The catheters draining the pleural cavity are withdrawn when full re-expansion has been obtained and after the period of fluid formation has passed. The need for drainage varies from 24-72 hours, most tubes being withdrawn on the 2nd or 3rd post-operative day.

7. X-Ray of the chest is taken after the operation to find out if the lung has expanded.

8. Blood pressure and pulse rate should be recorded every 15 minutes till they are stable. If the blood pressure falls or the pulse rate rises, the surgeon should be informed.

9. Temperature should be recorded every 4 hours.

During the *post-operative* period, the house-surgeon must watch for the following complications:—

1. Shock, which should be combated by blood transfusion or plasma transfusion.

2. Bleeding, which may be from the region of the Hilum of the lung.

3. Tension pnemothorax. This occurs as a result of the bronchial stitches giving way. This is an emergency and must be attended to immediately, to save the life of the patient. The patient becomes dyspnoeic and passes on to severe cyanosis. A needle should immediately be inserted into the pleural cavity and air aspirated. If a drainage tube has been there already, it must be connected to a suction. As a result of this complication, patient may develop an empyema or a bronchocutaneous fistula.

In those cases where the patient has a bronchial fistula, attempts are made to remove all the fluid from the chest and the patient is kept constantly on the operated side to avoid aspiration of secretions into the bronchial system.

Bronchial leaks usually appear about the second post-operative week. The patient complains of a little tightness and shortness of breath and he may cough out a large amount of sero-sanguinous fluid.

X-Ray examination of the chest will reveal the fluid level. Manometric readings may disclose air leaks. Post-pneumonectomy empyemas are treated by intrapleural injection of Penicillin and Streptomycin. If drainage is necessary, rib resection and open drainage has been chosen as the most suitable method.

On the 10th day, alternate stitches are removed and on the 12th day, remaining stitches are removed.

Suitable exercises should be taken to prevent deformity and stiffness of the back, especially after pneumonectomy or lobectomy.

If no infection of the pleural cavity occurs, convalescence is usually rapid and straight forward. The dead space after a

pneumonectomy or lobectomy fills up with fibrin so that a solid opaque hemithorax results.

Thus, there is no field in surgery in which close attention to detail and diligence in watching patients will pay greater dividends than in cases of lung resections. Emphasis therefore should be placed on:

1. a complete and careful pre-operative study of the patient to determine the nature and extent of the disease;
2. Adequate pre-operative preparation.
3. Careful post-operative management.

Acute Empyemas

The *pre-operative* investigations are:—

1. W.B.C. count and Hb. estimation.
2. Urine examination
3. X-Ray of chest with the patient in the standing position.
4. Sputum examination.
5. Pus aspirated from the pleural cavity to be sent for culture.

The *treatment* would be:—

1. Antibiotics or Chemotherapy.
2. The patient's general condition should be improved by giving nourishing diet, vitamins, protein hydrolysate preparations and blood or plasma, if necessary.
3. Aspiration of pus from the pleural cavity and instillation of Penicillin.

The site of aspiration should be in the 8th interspace in the midaxillary line, and may be repeated every other day.

Some of the dangers of aspiration are:—

1. The aspiration needle may injure the lung and a pneumothorax is then likely to occur and therefore the needle should be passed slowly into the pleural cavity.

2. Haemorrhage may occur due to injury to lung tissue or trauma to intercostal vessels. This may be prevented by passing the needle slowly into the pleural cavity and along the upper border of the rib.

3. Pus may pass along the needle track and may give rise to an abscess of the chest wall.

4. Pleural shock is another important complication but fortunately rare As a result of the needle going through the parietal pleura, it is likely to stimulate the vagal reflex and the patient gets a cardiac and a respiratory stand-still.

5. Air embolism is an important complication mentioned and is likely to occur especially if the needle has gone into a pulmonary vessel by mistake.

If the pus has become thicker then the pleural cavity has to be drained by rib resection.

This is done as follows:—

1. The chest wall must be prepared and, under local anaesthesia, the 8th rib is resected in the mid-axillary line and the pus drained. The drainage tube is connected to a bottle which is attached to a suction syphonage apparatus. (Wangenstein's apparatus) or to an electric Stedman suction pump to maintain slight negative pressure.

2 Antibiotics and other measures mentioned above must be continued to improve the general health.

3. The empyema cavity may be irrigated with Penicillin and about 200,000—300,000 units of Penicillin is left in the pleural cavity and suction discontinued for a short period.

4. The patient is asked to take deep breathing exercises or do the classical method of blowing coloured water from one Wolfe's bottle into another.

5. X-Ray should be taken to find out whether the lung has expanded.

6. The proper time for removal of the tube draining the pleural cavity may be determined in either of two ways:—One method is to take an X-Ray to find out the size

of the empyema cavity. The other method is to take periodic measurement of the amount of sterile saline solution which the cavity will hold and remove the drain when the volume of the space is reduced to no greater than 5 or 10 c.c.

The most important point in the management of these cases of empyema is to leave the tube in place long enough. If it is removed prematurely, the opening closes and pus may accumulate which may require drainage again.

The wound usually takes about 10 or 15 days more to heal.

If the empyema cavity persists, it is most probably due to:

1. failure of the lung to expand,

2. persistence of infection either due to its specific nature like tuberculosis or Actinomycosis of the lung or due to the presence of a bronchopleural fistula or foreign bodies.

3. inadequate drainage or premature removal of the drain.

Surgical management of cases of chronic empyema must of course depend upon the etiology. The empyema cavity must first be drained properly and the cavity may be irrigated with Dakin's solution twice a day. Dakin's solution is useful because of its antiseptic value. If the patient has a broncho-pleural fistula, irrigations with Dakin's solution should not be done. A suspected fistula can be demonstrated by injecting methylene blue solution through the fistula and observing the sputum for the blue colour. It has recently been demonstrated that sterilisation of the cavity can be obtained by the instillation of Tyrothricin or Penicillin and for dissolving the thick pus and exudate, a solution of Varidase has been found to be very useful. An initial dose of 150,000 units of Strepto-Kinase and 50,000 units of Strepto-Dornase is used. This may be repeated on alternate days. If these methods fail to heal the empyema, surgical treatment may be applied according to the indications in each case.

1. Thoracoplasty to obliterate the empyema cavity.

2. Pleuro-pneumonectomy, in cases where the lung is extensively diseased.

3. Decortication of the lung allows it to expand and thus obliterate the empyema cavity.

Tuberculous empyema:

In cases of tuberculous empyema, fluid should be aspirated frequently in an endeavour to relieve pressure on the lung and to encourage its re-expansion. If there is pleural thickening aspiration is followed by pleural lavage using flavine solution. In all these cases the pleural pressure should be left at a negative level after aspiration. Recently better results have been obtained by instillation of antibiotic agents like streptomycin or para-aminosalicylic acid. These drugs are of course helpful in checking the tubercular infection, but they are not able to help in re-expansion of the lung. In those cases the obliteration of this cavity can be done only by thoracoplasty.

Thoracoplasty

The management in a case of Thoracoplasty will be just the same as for Lobectomy or Pneumonectomy with the following additional measures: —

The treatment in these cases is carried out in close cooperation with the pthisiologist. Bed rest for the patient is necessary. Temperature should have settled down. General health should be improved by giving proper nourishment, vitamins and protein hydrolysates.

Patient is prepared by pre-operative blood transfusions.

After operation, the usual post-operative treatment is given. The patient either lies in bed on the operated side or a sandbag is placed on the operated side to prevent paradoxical respiration.

There may be a certain amount of blood stained discharge for the first 24 to 48 hours and the dressings will have to be changed. Drainage tube is removed 72 hours later and

sutures are removed on the 11th or 12th day. X-Ray of chest is taken post-operatively to see the degree of pulmonary collapse.

Lung Abscess

In cases of lung abscess, the usual investigations mentioned for a thoracic case are done. In addition, bronchoscopic aspiration is resorted to, especially if it communicates with a bronchus.

Postural method of drainage is also adopted when necessary. Patient's general condition must be improved before an operation such as Lobectomy or resection by a pre-operative blood-transfusion. A high caloric, high vitamin diet is also prescribed. Chemotherapy or antibiotics and penicillin inhalation are given for these patients. Post-operative, care would be on the same lines as for a lobectomy.

Bronchoscopy

1. No special preparation is necessary except that the patient should be starved after midnight.

2. Morphia and atropine to be given after consulting the anaesthetist.

The patient is given liquids about 4 hours after examination. If the patient is able to tolerate semi-solid food, this may be given in the evening or night.

CHAPTER 26

SURGERY OF THE THYMUS GLAND

Total thymectomy is being done for cases of myasthenia gravis and tumours of the thymus gland. Two important workers, Keynes of Great Britain and Blalock of Baltimore, have made outstanding contributions on this subject. They have evolved a method of treatment after doing this operation on a number of patients.

The *pre-operative* investigations that are done are as follows: —

1. Examination of blood, R.B.C., W.B.C. counts and Haemoglobin percentage.

2. Urine examination.

3. Radiological examination of the neck and chest (A.P. and lateral view) to show the presence and size of the tumour behind the sternum.

4. Tomography.

5. X-Ray of the lungs.

6. Prostigmine test. The response of the patient to Prostigmine injection and the amount necessary for each patient is calculated. In some cases 2 grs. may be necessary and in others, about 4 to 6 grs. in 24 hours.

The *pre-operative* treatment will be as follows:

1. Improving the general health of the patient.

2. Controlling any infection by chemotherapy or antibiotics.

3. Teaching the patient how to do deep breathing exercises.

4. The day before operation, the neck and chest to be prepared in the usual manner.

5. No enema should be given to the patient with myasthenia gravis as it may produce alarming syncope.

6. The amount of prostigmine necessary to stabilise the patient must be calculated and this may take a week or ten days before the patient is ready for operation.

7. If the patient is having a thymic tumour, preliminary deep X-Ray therapy is given before operation is contemplated.

8. On the day of the operation, prostigmine is given about 30 minutes before the operation.

9. Premedication is done after consulting the anaesthetist.

Post-operative care:

1. Just before the operation is over, Keynes recommends 1 mgm. of Prostigmine to be injected in order to promote good breathing as the patient is recovering from anaesthesia.

2. The position of the patient after operation. Patient should be lying flat in bed and any mucus secretions in the mouth or throat should be aspirated by the nurse. After the patient has regained complete consciousness, he can be put on the semi-reclining position.

3. Breathing exercises are continued during the post-operative period and the patient is instructed to cough to prevent any lung complications.

4 Antibiotics are given to control any infection in the post-operative period.

5. Careful nursing and a watch on the pulse, respiration and blood pressure should be kept for the next 48 hours.

6. Prostigmine is given intramuscularly every [illegible] hours. Keynes advises that the prostigmine dose should be temporarily increased during the post-operative period. After [illegible] or 3 days, the drug is given by mouth and the dose is progressively reduced depending upon the individual requiro-

ment If the patient is having any abdominal cramps, then the prostigmine dose should be reduced.

7. Routine X-Ray of the chest should be taken to find out whether the patient is having any pneumothorax.

8. As soon as the patient has recovered from shock, intravenous fluid therapy must be stopped and the patient is allowed to take fluids by mouth.

9. *Diet*: The diet must be fluids during the first two or three days thereafter, semi-solid food is given depending upon the ability of the patient to masticate and swallow the food.

10. Rehabilitation of the patients are necessary before they are discharged from the hospital. Exercises to the various muscles to improve their tone, are carried out in the post-operative period. Complete recovery may occur immediately after operation in a few cases while in others, it may take weeks or months.

CHAPTER 27

CARDIAC SURGERY

The *pre-*and *post-operative* care of the patients suffering from cardiovascular anomalies or diseases are as follows. Pre-operative investigations are : —

1. Blood examination: (a) R.B.C. count, (b) W.B.C. count, (c) Haemoglobin percentage, (d) Blood culture, and (e) E.S.R.
2. Serum proteins
3. Arterial oxygen saturation.
4. Wasserman and Kahn.
5. Blood grouping.
6. Urine examination.
7. Electro-cardiogram.
8. X-ray of the lungs and screening.
9. Cardiac catheterisation and Angio Cardiography.

These patients, even if fully compensated, should be given the benefit of a few days rest before operation. Complete physical and mental relaxation during this period allows the surgeon to study the cardiac and renal reserve. The drugs usually given for these patients are:

(i) Sedatives to give complete rest.

(ii) Digitalis, if patient has congestive failure or auricular fibrillation.

(iii) Fluids must be administered cautiously as there is always a danger of pulmonary oedema.

The fluid should be given very slowly to avoid any sudden increase in the blood volume. Smaller transfusions are safer when given at intervals of 10 to 12 hours. If the patient is having congestive heart failure, the fluids should not be given through the intravenous route. Fluids can be taken by mouth till midnight before the day of operation.

During the operation, the amount of blood loss should be calculated and replaced. The anaesthetist should be consulted for any premedication before operation. There should be enough blood to cope with the blood loss that may occur in operations on the heart.

Chemotherapy or antibiotics should be started [illegible] hours before operation. As soon as the anaesthesia is started, the vein at the ankle should be exposed and a drip transfusion of plasma or blood should be started.

Post-operative management:

1. After the operation, the patient is taken to the post-operative room and is placed in an oxygen tent.
2. Antibiotics are continued.
3. Morphia may have to be given every [illegible] or 8 hours to control pain or discomfort or restlessness.
4. Vitamins should be administered intramuscularly and Vitamin C, 500 mg. intravenously.
5. Fluids: When the blood pressure returns to normal, the plasma or blood transfusion is stopped and 5 % glucose in water or saline started The amount of fluid replacement varies with the age of the patient and the cardiac status. In an adult, not more than 1500 c.c. of fluids is given in 24 hours by the intravenous route After the first 24 hrs. the patient is given fluids by mouth.

Any secretions in the pharynx or trachea are aspirated by a sucker.

The patient is turned from side to side to induce coughing and prevent complications like atelectasis of the lung. Blood pressure should be recorded every 15 minutes for the first 4 hours and then every half hour for the next 6 hours and, thereafter, every hour or two till the patient has returned to normal. The patient should not be lying always on the non-operated side. X-ray films must be taken every day to find out whether the lung has fully expanded and if there is any collection of fluid in the pleural cavity. The rest of the post-operative care will be the same as mentioned in the chapter on Thoracic Surgery.

CHAPTER 28

VASCULAR SURGERY

Venous thrombosis with pulmonary embolism is most commonly seen following major surgical procedures, trauma to the extremities and chronic illnesses which require long periods of rest.

The deep veins of the calf are the most common site of origin for thrombosis. The thrombosis may proceed upwards into the large veins of the leg and thigh. In a few cases, thrombosis may occur in the veins of the broad ligament and pelvis from where it may spread to the iliac and femoral veins. This thrombus that has formed in the large veins is likely to get dislodged and may pass upwards giving rise to sudden death from massive pulmonary embolism.

Age incidence for a thrombo-embolic disease to occur is over 40 and the highest incidence has been noted in persons past the age of 50, who have had an abdominal or pelvic operation for malignant disease. To-day, pulmonary embolism is rare because of the better understanding of the etiological factors, early diagnosis and prophylactic measures that are undertaken to prevent embolism by interruption of the venous channels of the lower extremities. The predisposing factors which are responsible for development of this condition of venous thrombosis are: —

1. Injuries to the lower extremities.
2. Chronic illnesses.
3. All factors which favour venous stasis in the extremities as in cases of:

(a) a high Fowler position being adopted during post-operative period after major abdominal operation.

(b) abdominal distension.

(c) tight abdominal binder.

(d) pressure on the popliteal space when the patient is put in the Fowler's position or if a pillow is placed under the knee.

If these factors are eliminated, intravascular thrombosis of the extremities can be prevented. Other factors which also play a part in the development of this condition of venous thrombosis are : —

1. Obesity,
2. Anaemia,
3. Acute infections.

Venous stasis in the lower extremities is the most important single factor in the development of spontaneous thrombosis of the veins and all possible measures should be taken to prevent stagnation of venous blood in the extremities. There are two types of conditions which are recognised to-day:

1. Thrombo-phlebitis; 2. Phlebo-thrombosis.

Thrombo-phlebitis, as the name implies, is an inflammatory lesion affecting the vein wall with associated venous thrombosis. The clot in thrombo-phlebitis is of white variety and is firmly attached to the vein wall and seldom becomes detached. In the case of phlebo-thrombosis, the clot formation occurs as a result of tissue injury which may be accidental or result from an operation. The symptoms and signs are:

1. The patient usually gives a history of severe pain in the calf before the onset of the swelling.

2. The limb becomes swollen and shows a moderate degree of cynanosis with dilatation of the superficial veins.

3. There is severe tenderness of the calf and along the course of the femoral vein in the thigh and groin.

In cases of phlebo-thrombosis, the thrombus in the popliteal or femoral vein is not adherent to the vein wall and hence it is likely to be swept upwards to the heart and may

occlude the pulmonary vessels which may end in a fatality. The diagnosis of these cases can be made by:

1. a careful examination of the extremities.

2. swelling of the leg and local tenderness over the deep veins.

3. discomfort or pain in the calf or popliteal region when the patient does a dorsiflexion of the foot. (Homan's sign).

The temperature, pulse and respiration may be increased when the patient develops a small pulmonary embolism. Elevation in the pulse rate, out of proportion to any other finding, is suggestive of phlebo-thrombosis. In some cases, the embolism may be very small and give rise to a pulmonary infarction which can be easily recognised in a roentgenogram of the chest. If the patient develops a severe pleuritic pain, it is pathognomonic of infarction of the lung.

In cases of doubt, the E.C.G. help us to differentiate between pulmonary embolism and coronary thrombosis.

Prevention. The incidence of venous thrombosis can be reduced if every effort is taken to prevent venous stasis in the lower extremities.

1. Position of the patient after operation is very important to prevent deep venous thrombosis. The head of the bed should be raised on blocks and a board is placed near the feet so that the patient can push it with his feet. This prevents any venous stagnation by giving exercise of the calf muscles.

2. Tight abdominal binders should not be used after major abdominal surgery.

3. Abdominal distension should be prevented or corrected as early as possible. If distension is present, it interferes with venous return from the lower extremities.

4. Early ambulation has been advocated by many surgeons and the patient is allowed out of bed the next day after operation and he should be made to walk from the 2nd day onwards. If the patient is in the sitting or Fowler's

position after operation, he is likely to develop venous thrombosis. When such a complication is likely to arise, anticoagulants like Heparin and Dicoumarol may be used Heparin is difficult to administer but its effect can be more readily controlled. Dicoumarol can be given by mouth and the Prothrombin time determination should be done daily. Instead of Dicoumarol, Tromexan can be given and the dosage of the drug will depend upon the Prothrombin time that is estimated daily. In some cases, severe uncontrollable haemorrhage has been reported following the use of these drugs. If there is any tendency for haemorrhage, a blood transfusion may have to be given and Vitamin K injections are administered.

In some cases, as a prophylactic measure, bilateral interruption of the superficial femoral veins is done as a routine in some Clinics. This procedure is carried out on patients past the age of 50 or 60 and who are to undergo major abdominal or pelvic operations for malignancy.

Treatment for cases of venous thrombosis:

1. Rest in bed.

2. Injection of the lumbar ganglia with Procaine solution.

3. Anticoagulants like Heparin and Tromexan.

4. Bilateral femoral vein ligation prevents many cases of pulmonary embolism.

5. In some cases, common iliac ligation is done to prevent the thrombus from ascending upwards.

6. Interruption of the inferior venacava may be necessary in certain cases High levels of interruption like the common iliac or inferior vena cava ligation should be resorted to for cases of thrombo-embolic disease in which the femoral veins have been thrombosed for a week or more. Inferior vena cava ligation is preferable to bilateral common iliac vein interruption because the venous drainage from the extremities can be interrupted through a single exposure.

Pulmonary embolism:

Post-operative pulmonary embolism is one of the major tragedies of pelvic surgery. Death in the majority of cases is due to failure of the right heart resulting from plugging of the main trunk or one of the main branches of the pulmonary artery. In such cases, death occurs within a few minutes. In some cases where the embolism is very small, the patient may survive. If the patient has phlebothrombosis without infection, the intravascular clot may be dislodged. The dislodgement of the clot may occur suddenly when the patient gets out of bed or has a bowel movement or an enema. As a result of this embolism, the patient suddenly experiences an excruciating pain in the chest, becomes cyanotic and respiration becomes shallow and rapid. The blood pressure falls, the pulse becomes rapid and feeble and the patient has an anxious expression with beads of sweat on the face. The patient may die within a few minutes; but if he survives for two or more hours, his chances for recovery are better. If the patient lives long enough, an electro-cardiogram may be done to differentiate this condition from coronary occlusions.

The treatment for cases of pulmonary embolism consists in:

1. $\frac{1}{4}$ gr. of Morphia intravenously at once, to relieve pain and anxiety and papaverine in doses of 0·06 to 0·12 gm. should be given intravenously immediately.

2. Patient should be placed in a semi-upright posture and oxygen administered continuously.

3. If death is not immediate, and if signs point to a massive embolism, the question of pulmonary arterio-embolectomy or Trendelenberg operation should be considered.

If the patient survives the attack, cough, haemoptysis and fever may develop

X-ray picture of the lungs confirms the diagnosis and the patients should be given:

(a) Cardio-respiratory stimulants;
(b) Oxygen inhalation;
(c) Penicillin to control infection.

Conclusion:

The treatment of thrombo-phlebitis and phlebothrombosis may be considered under three categories.

1. Prophylactic;
2. Conservative;
3. Operative prophylaxis.

1. *Prophylactic*

1. Gentleness in operation in order to minimise injury to the pelvic veins.

2. Deep breathing is encouraged and the patient is asked to take several deep breaths each hour and respirations may be stimulated with carbon-dioxide.

3. Fowler's position is avoided as pressure on the popliteal vessels tends to slow the venous return.

4. Abdominal distension should be prevented, for its presence may hinder the return of venous blood to the thoracic vena cava.

5. Tight abdominal binders should not be used as it interferes with venous return.

6. Patient should be encouraged to move his lower extremities and a wooden board is placed at the foot end of the bed so that the patient can exercise his calf muscles by pressing it with his feet as often as possible.

At the present time, anticoagulants like Heparin and Tromexan are being used as prophylactics in some clinics. Routine use of these drugs in all cases is far more hazardous than is the risk of the development of venous thrombosis. This is particularly true in operated patients in whom the danger of haemorrhage is even greater than it is in other patients In some clinics, alpha Tocopherol combined with calcium has been administered to patients to prevent the development of venous thrombosis and has met with some success.

2. *Conservative treatment*

1. In cases of active thrombo-phlebitis, the lower extremity is elevated by about 30°.

2. Hot fomentations to extremity to ease the pain.

3. Sedation must be used to relieve the acute pain.

4. Laxatives should be given and enemas avoided.

5. Antibiotic therapy should be instituted immediately.

6. Injection of the sympathetic ganglia or paravertebral sympathetic block using a local anaesthetic like Procaine with Bromosalizol may shorten the course of the disease.

7. The patient is kept in bed for about a week thereafter.

8. Swelling of the feet and legs might occur and the patient is advised to have an elastic bandage to keep down the swelling.

3. *Operative treatment*

Bilateral femoral vein interruption should be done:

1. In all cases of deep venous thrombosis of the lower extremity.

2. In cases of non-fatal pulmonary embolism, irrespective of whether or not the legs show signs of venous thrombosis.

3. In cases where the patient is to be subjected to major abdominal or pelvic operations for malignant disease.

Varicose Veins

A varicose vein is one which has become permanently dilated, lengthened and tortuous. The veins of the thigh and leg, the spermatic veins, the veins in the ano-rectal region and in the lower end of oesophagus are the ones that are usually involved. In this chapter, the care to be taken for varicose veins of the leg will be described.

This condition may be due to a number of causes and is more common in women than in men and usually occurs after the age of fifty.

The causes are:

1. Congenital abnormalities for e.g. incompetency or absence of valves at the upper end of long saphenous vein.

2. Prolonged standing for e.g. Policemen, waiters and nurses are all suitable candidates for the development of varices.

3. Obstruction to the veins which may be due to elastic bands (e.g. garters in men) or in women due to pregnancy. In pregnancy there is venous engorgement of the iliac veins as a result of increased blood receipt from the uterine and ovarian veins. This great increase of blood received at the iliac vessels may render the channel for the blood received from the legs inadequate. In this way a back pressure effect may be transmitted to the veins of the leg. Later the pregnant uterus itself may press upon the veins and may give rise to an increase in the varicosity of the veins in the later stages of pregnancy.

4. Arterio-venous aneurysms may also cause varicosity of the veins.

5. Hereditary factor: This also is supposed to play a part in the development of varicose veins.

Investigation of the patient:

A careful investigation of the patient is essential before subjecting them to treatment.

Complete physical examination must be made. Any evidences of peripheral arterial diseases, pelvic tumours and other general diseases should be noted when the patient is examined. If patient has diabetes, severe anaemia, myocardial and renal disease, any active treatment for the varicose veins is contra-indicated till the general disease is cured or controlled.

Local condition: Examination of the foot and leg are done and the extent of involvement of the long or short saphenous vein is noted. A note should be made of the size of ulcer if present and the colour of the foot. Various tests

have been evolved to determine the competence of the valves. The tests are:

1. The Trendelenburg test to determine the competence of the valve at the upper end of long saphenous vein.

2. Perthe's test to demonstrate the patency of the deep veins.

3. Ochsner-Mahorner: This test gives information regarding the condition of deep veins, communicating veins and the long saphenous vein at various levels.

These tests therefore help the surgeon to decide on the line of treatment.

4. Examination of the arteries should be done in all elderly patients who are having varicose veins.

The following tests are carried out:

1. Examination of the pulse at various levels in the limb.
2. Oscillometer test.
3. Samuel test.
   (Rubor with dependency and palor with elevation of the limb).
4. Venography or phlebography has been very useful in demonstrating the patency of the communicating system of veins and also whether the valves are competent or not.

Treatment:

1. Surgical treatment.
2 Injection treatment.
3. Conservative treatment.

1. Active *surgical treatment* is advised only when one is satisfied that there is no risk to life following such a procedure.

Surgery is indicated in all cases where there is incompetency of the valves of the superficial venous system. Before removing, one must ascertain whether the deep veins are patent or not by the various tests mentioned already. Patients with incompetent valves in the great saphenous system require high ligation of the saphenous vein at the

saphenofemoral junction. This is known as the Trendelenburg operation.

Having completed the operation of high resection or ligation of the great saphenous vein the distal varices are treated by excision or by injection. The incompetent communicating channels between the deep and superficial systems lower down the thigh must also be dealt with at operation by ligating the communicating branch as well as the great saphenous vein above and below it or by stripping the varices subsequent to individual ligation of the communicating veins.

Incompetency of the valves of the short saphenous system must also be treated by ligation, and the varices in the calf are best dealt with by injection. These patients must be examined regularly to know whether the varices have disappeared or increased in size and whether the thrombosed varices have become recanalised.

2. *Injection* treatment: There is a great deal of controversy regarding the use of sclerosing solutions for obliterating the varicose veins. Some are of opinion that the injection method is dangerous and the effect is of no lasting value except for it being a cosmetic procedure. While the other group of surgeons maintain that the right amount of fluid given at the proper place taking all precautions may be superior even to surgery.

The sclerosing solutions used are:

1. Quinine Urethane.
2. 5% Sodium Morrhuate.
3. Mono-ethanolamine oleate (Ethamolin).

This solution produces an injury of the intimal lining of the vessel which later gets obliterated by thrombosis.

The following precautions must be taken when injecting the sclerosing fluid.

1. Patient must lie on the Operation table.
2. A tourniquet must be applied to render the varices prominent.

3. The skin over the varices must be cleansed with surgical spirit.

4. The vein must be fixed and the needle passed along the vein for a short distance before entering the vein. This method prevents the solution from escaping as the puncture on the skin and that on the vein is not at the same level.

5. The ideal volume of the sclerosing fluid to use is 1·5 to 2 c.c. at one sitting.

6. When the injection has been given, the needle should be withdrawn and a small sterile gauze placed over to prevent any escape of the solution. This solution if it escapes may produce an ulcer and hence the leg is raised slightly for a few minutes after injection treatment.

7. After the injection is over the patient must be asked to carry on his normal work and should not go to bed.

8. The interval between injections should be about a week.

Complications:

1. Collapse of the patient. (Ampoules of 1:1000 adrenaline and coramine must be available to combat this condition).

2. Sudden giddiness due to cinchonism when quinine urethane solution is used; hence injection should be given with patient lying on the couch.

3. Urticaria.

4. Embolism. This can be avoided by preventing the patient from going to bed after treatment.

5. Cellulitis and *ulcer formation occur due* to error in technique.

6. Thrombosis of deep veins is followed by oedema of the limb This can be treated by the application of elastic bandages.

7. Phlebitis:

If deep phlebitis occurs anticoagulant therapy may have to be given.

In the case of superficial phlebitis this is best treated by ambulation and bandage of the limb.

Conservative treatment:

Patients who are unfit for injection or operative treatment are treated in the following manner.

1. Elastic bandages or stockings.

2. The skin of the leg and foot are washed with soft soap and water and dried with a soft towel before using the bandages or stockings.

3. If ulceration is present elastic adhesive bandage is used. In those cases where elastoplast cannot be used due to allergy, an elasto-crepe is used.

4. Physiotherapy and massage together with active and passive movements are prescribed for persons with varicose ulcers. Massage is of value in oedematous limb and adequate exercise helps the patient to resume his former avocations as early as possible.

Varicose veins during pregnancy.

This is best treated by adopting the palliative measures mentioned above. The varices may completely disappear after delivery. If operative treatment has to be done it is usually undertaken two months after delivery.

CHAPTER 29

NEURO-SURGERY

The house-surgeon attending on a Neuro-surgical case must have a complete history of the case taken from the patient and the relatives and record all the pertinent facts, findings and his impressions of the case on the case sheet. If the patient is admitted with a brain injury, it is necessary to find out whether the patient is in a state of concussion or cerebral compression. Trotter has defined concussion as "a wide-spread paralysis of the functions of the brain which comes on as an immediate consequence of a blow on the head, has a strong tendency for spontaneous recovery and without any organic lesion of the brain substance". A few patients, of course, suffer from concussion of the brain alone. After the concussion, the patient gets a mild degree of oedema of the brain and that may give rise to certain symptoms like cerebral irritation or if it is very severe, the patient may go on to a state of cerebral compression. Lacerations of the brain may occur as a result of a direct injury or a gun-shot wound and sometimes, the patient may have contrecoup injuries. In addition to these primary injuries the brain may suffer secondary damage either while the effects of primary injury are in force or after the patient has begun to recover from the effects of primary injury. Secondary damage may also occur due to middle meningeal artery rupture or due to rupture of blood vessels running between the dura and the skull. Thus the patient gets an extra-dural haematoma. Sometimes the patient also gets a rupture of the veins running between the brain and the venous sinuses and the blood accumulates in the subdural spaces. These patients might recover from the primary injury but very soon pass into a state of coma.

The investigations that should be done after admission into the hospital consist of a general and a neurological examination. The following points are noted : —

1. The nature of the injury to the head and the rest of the body.

2. The degree of unconsciousness.

3. Examination of the size of the pupils and the pupillary reflexes are noted every 15 minutes to half an hour and this should be charted under Rt. and Lt. pupil to show immediately to the Surgeon if there is any discrepancy in the size of the pupils.

4. Examination of other reflexes like the knee and the ankle and evidences of any paralysis or paresis of the limbs.

5. Pulse rate to be recorded every ½ hour during the first 24 hours.

6. Blood pressure recorded every 4 hours.

7. Lumbar puncture and estimation of its pressure should be done only after consultation with the surgeon. The respiratory rate should be noted. If there is any dilatation of the pupil, alteration in the reflexes, slowing of the pulse rate and rising of the blood pressure, it is an important evidence that the patient is developing a cerebral compression.

Rapid elevation of the temperature is of grave prognosis If the patient develops a cheyne-stroke type of breathing, recovery is rare

Treatment:

When the patient is in a state of shock, it is the duty of the hospital staff to carefully watch the patient and an intelligent and alert nurse can easily recognise whether the patient is getting into a state of cerebral compression or cerebral irritation. When the patient is in a state of shock, this should be treated before anything else is done. Shock is treated as in other types of injuries. The lacerated wound of the scalp, if present, is covered by a sterile dressing and when the patient has got over the shock, the scalp is shaved, the skull carefully examined for fractures and wound debridement done and sutured. In some cases, the fracture may extend through the cribriform plate of the ethmoid bone or it may run through the petrous portion of the temporal

bone when blood and cerebro-spinal fluid may be noticed escaping through the nose or the ear. If the cerebro-spinal fluid is escaping through the nose, the patient is instructed not to blow his nose as infection from the nasal cavity is likely to pass up and may result in a meningitis. Cleaning of the nose should be done very carefully with sterile cotton wool and the nose should never be plugged with cotton wool. If there is blood or cerebro-spinal fluid escaping through the ear, the house surgeon should remove all the clots and a small plug of sterile cotton must be placed. The ear should never be syringed and the patient should be made to lie on the injured side so that the blood or cerebro-spinal fluid may easily drain off. In some cases, where the leakage is more than the usual, a sterile pad may be placed over the ear so as to absorb all the drainage. Patient may be given antibiotics or chemo-therapeutic drugs as a prophylactic.

Cerebral oedema can be controlled by limiting the fluid intake. Sometimes, dehydration may be necessary and that is done by giving Mag. Sulph in 1½ oz doses. If the patient is having severe cerebral irritation, retention enemas using saturated solution of Mag. sulph 6 oz is given In severe cases, [illegible] % glucose or sucrose solution intravenously produces dehydration of the brain rapidly. It may be necessary to inject 50—100 c.c. of 50 % glucose solution or 50—200 c c. of 50 % sucrose solution. These two drugs reduce the intracranial pressure If the patient is restless, sedatives are required but are given sparingly. Phenobarbitone or Luminal is given in doses of 2—3 gr Chloral Hydrate about 15 gr. and Potassium Bromide gr. 20 is given in a mixture and administered to the patient 2 or 3 times a day. If the patient is very restless in spite of the sedatives, lumbar puncture may be necessary. Water balance of the body must be regulated and the diet must contain plenty of vitamins and enough calories must be provided. Morphia should never be given because of the danger of too great depression of the medullary centres. The body temperature may be raised in some cases of head injuries and, if it is high, ice packs or cold packs are applied to the body of the patient. If the fever is due to

pneumonia or meningitis, chemotherapy or antibiotics are given. If the patient is having severe hyper pyrexia, there is no effective treatment to control it except by giving him aspirin. In all these cases of head injury, an X-Ray of the skull is necessary and it should be taken in antero-posterior and lateral views. Another picture should be taken to bring out the occipital bone and Foramen Magnum by giving a 30° tilt when the antero-posterior view is taken. In some cases, electro-encephelogram may be of use and this will depend upon the wishes of the neuro-surgeon.

These patients with head injuries have difficulty in passing urine and the bladder may become over-distended, the best way to overcome this difficulty is to use a tidal drainage apparatus.

For all *operations of the brain,* whether it be a removal of the tumour or a decompression operation, the patient is given a careful check-up. Routine examination of the heart, lungs, blood pressure, urine analysis, renal function tests, blood for W.R. and blood urea determinations should be done X-Ray of the skull, examination of the eye grounds and visual fields, X-Ray of chest of adults to rule out any primary growth, and if the patient has got a pituitary tumour, B M R, X-Ray of Frontal sinus, glucose tolerance test and careful record of intake and output of fluids should be done

If the patient has got a tumour of the cerebello-pontine angle, audiometric test and caloric vestibular test should be done.

Ophthalmoscopic examination is very necessary in these cases. The pre-operative preparation consists in giving the patient an enema on the morning of operation, the head shaved and blood should be ready in the operating room during the operation.

After the operation, the patient lies in bed in the horizontal position for 6—8 hours. Half-hourly pulse and tem-

perature every hour should be recorded. Fluid balance must be maintained. Feeding of these patients in the post-operative period consists in giving them liquid diet for the first two days and then soft diet after that.

The sutures on the scalp can be removed on the 4th or 5th day. In some cases, patients may not be able to swallow freely and an indwelling Ryles tube may have to be used for feeding purposes. Pain is an important factor which may be present after the patient comes round from the anaesthetic and this can be controlled by giving him aspirin and phenacetin. The patient should be watched during the post-operative period very carefully. Reflexes may change, dilatation of pupil may commence, stupor or dizziness may occur, the pulse may become slow and the blood pressure elevated. These indicate haemorrhage or post-operative cerebral oedema. Hypertonic solutions can be given to reduce the cerebral oedema, but if it is due to haemorrhage, as it will produce serious damage to the brain it is necessary to open again and not to wait and so lose the patient from haemorrhage. Mental disturbances are not uncommon after operation and the house surgeon and nurse must realise that it is quite common and can pass off only if those attending have a calm and tolerant attitude. If the damage is on the frontal lobes, mental disturbances are more severe.

Lumbar Puncture

Lumbar puncture is done to determine the pressure of the cerebro-spinal fluid and to remove fluid for analysis. It is also done to reduce increased intra-cranial pressure after brain operations. If the patient is having a choked disc or cerebellar tumours, lumbar puncture is a dangerous procedure and is contra-indicated. The lumbar region is cleaned with an antiseptic solution and the needle is passed between the 3rd and 4th lumbar vertebrae, the cerebro-spinal fluid pressure is recorded with a manometer and the Queckenstedt's test is also done to find out if there is any spinal tumour. About 8 c c of fluid is removed for examination—for bacte-

riological and biochemical tests. After it has been done, the patient must lie flat in bed without a pillow. A small percentage of patients develop headache. This usually clears by giving the patient some intravenous hypotonic saline solution.

Spinal Injuries

Injuries to the spine may or may not be associated with damage to the spinal cord Fracture dislocation of the spine may result in a compression of the cord and interference with the passage of sensory and motor impulses distal to the site of injury If the patient gets a paraplegia after injury, the patient is likely to get one of the three complications, pneumonia, renal infection and bedsores.

The patient should be carefully handled. He must be transported in the supine position with the head extended and placed between sand bags especially in cases of fracture dislocation of cervical spine. If the injury is at any other level, the patient must be transported in the prone position and the spine is kept as straight as possible. The patient should be moved only on stretcher and care must be taken to see that he does not raise his head or arch his back while being transported. Shock in spinal injury is treated as in any other type of injury. In cases of fracture, or dislocations of the cervical vertebra, sand bags should be placed on either side of the head to prevent twisting of the neck and a Glissons sling or a Jury rig is applied and a weight extension is done. The bed of the patient must be kept dry. The bed sheets are arranged smoothly over mattresses laid on fracture boards. The nursing attention of these patients play an important part. The skin of the back is rubbed with rectified spirit followed by application of zinc oxide and starch powder every four hours. The pressure points must be protected by cotton wool. Patients are usually constipated and a mild aperient or an enema may be given in the morning. The bed pan must be used as gently as possible to prevent any injury over the sacral region.

In cases of injuries of the cervico-dorsal region, the micturition centre in the spinal cord is not affected and so an automatic periodic reflex micturition is established. If the cauda-equina is injured, paralysis of the Detrusor muscle results and a chronic retention with overflow occurs. The bladder can be emptied by compressing the abdominal muscles or by pressing on the suprapubic region. These patients are likely to get infection of the bladder and the kidneys and, as prophylaxis, chemotherapeutic and antibiotic drugs are given. For the first 24—48 hours, after the injury, the patient may not be able to pass urine and the bladder is emptied by a urethral catheter. Repeated catheterisation may have to be done for about 3 or 4 days; later a tidal drainage is instituted. If the patient has developed an injury of the urethra or has got a stricture of the urethra, then a suprapubic cystostomy has to be done. In these cases of fracture or fracture dislocation, immobilisation in plaster has to be done after reduction.

Laminectomy

Laminectomy is done in those cases where there is a depressed fracture of the lamina or when the patient complains of severe root pain after spinal injury This operation is usually done only after the patient has recovered from spinal shock.

Careful preparation of the skin of the back should be done and sterile dressing should be applied after cleaning with spirit. Patient has a normal diet until the night preceding the operation After the operation, the patient lies in the prone or semi-prone position

During the first few days after operation, the patient has slight temperature due to leakage of cerebro-spinal fluid in the wound. The head is kept low and penicillin is given parenterally.

The sutures are removed on the 10th post-operative day.

The complications that are likely to occur are:

1. Shock.
2. Haemorrhage.
3. Respiratory tract infection.

These can be treated by the usual methods described above.

Surgery of the Sympathetic Nervous System

Lumbar sympathectomy: This operation is done for cases of Thrombo-angitis Obliterans, Hyperhydirosis of feet and Hirshprung's disease.

The pre-operative investigations in these cases are as follows: —

1. General inspection of the limbs and notes on the colour of the feet,

2. The description of any ulcer or local gangrene in the toe.

3. The presence or absence of pulsation in the affected limb.

4. If there is no pulsation felt at the ankle, oscillometric readings are to be taken to show the level of pulsatile collateral supply in the limbs.

5. Postural tests: Rubor with dependency and pallor with elevation will indicate the level at which the circulation is failing and the angle of circulatory sufficiency could be noted.

6. Skin temperature over the limbs are taken before and after covering the patient with three blankets and the Browns Vasomotor Index is calculated to find out the degree of Vasospasm.

$$\frac{\text{Rise in skin temp.—Rise in mouth temp.}}{\text{Rise of mouth temp.}} = \begin{array}{c}\text{Brown's Index}\\ \text{or}\\ \text{Vaso motor Index}\end{array}$$

This index gives the degree of Vasospasm present and if it is more than 2·5, sympathectomy may be useful to relieve the symptoms of the patient.

7. Paravertebral sympathetic block is also a good method by which the degree of circulatory release in the lower limb may be observed.

This is done as follows: —A long needle about 72 cms. is inserted 3 cms from the midline and passed forwards and inwards at an angle of 20° to the side of each lumbar vertebra. The needle is then withdrawn somewhat and the angle altered so that the point just misses the vertebral body and reaches its edge anteriorly. 10 c.c. of 1 % Novocaine is injected after trial aspiration has proved that the needle is not in a vein. Injection is made at the sides of 3 vertebrae in series. Vasomotor paralysis of the lower limb follows and the limb becomes warm to touch. Temperature measurements are made with skin thermometer or Thermocouple and the Brown's Index is calculated.

8. Spinal anaesthesia test is the easiest to findout the degree of Vaso release in the lower limbs. This can be done when other methods are not helpful in deciding the line of treatment. The patient is prepared for an operation of lumbar ganglionectomy and after spinal anaesthesia is given, pulsation in the main vessels of the lower limb on the affected side can be compared with those of the normal limb and the skin temperature taken to decide whether the operation will help him to relieve his symptoms. It has this advantage over all other methods, that if satisfactory thermal changes are observed, an operation for sympathectomy can be proceeded with at once.

9. Plain X-Ray of the limbs to find out if there is any calcification of the vessels.

10. Arteriography is useful to show the general pattern of vessels and the type of collateral circulation that is present. It is also useful to distinguish between organic block and vasospasm.

The other routine investigations are similar to any major abdominal operation and this includes complete urine examination, blood examination, blood for W. R. and Kahn;

FIG 56 Arteriogram showing the pattern of vessels and the type of collateral circulation in Thrombo-angitis obliterans.

11. Plain X-Ray of the chest and a consultation with the Cardiologist and if necessary an E C.G., bleeding and coagulation time are done.

The *pre-operative* preparation consists in:

1. Abdomen and back to be shaved and washed with soap and water.

2. Enema to be given the previous night.

3 Light dinner is given at 8 p.m. and no fluids after midnight.

4 Patient to be grouped and blood should be available during operation.

The *post-operative care* of these patients consists in giving morphia to relieve the pain, blood pressure taken every 6 hours, pulse and respiratory chart to be maintained every half an hour; blood, plasma or saline transfusion to be continued after the operation depending upon the patients general condition.

Liquid diet for the 1st two days and after the patient has had a normal bowel movement on the 3rd day he can be put on semi-solid diet. Stitches are removed on the 10th day.

Upper Thoracic Sympathectomy

This operation is done for cases of Raynaud's disease, Hyperhydirosis of the upper limb, Scleroderma and in all vasopastic disorders. There are two approaches for dorsal sympathectomy. The anterior approach is popular in Great Britain and the posterior, the method of choice in America. Through the anterior approach the sympathetic chain can be sectioned but regeneration may occur, but by the posterior approach they can be dealt in such a manner that regeneration is not possible.

The *pre-operative* tests are the same as for a case of lumbar ganglionectomy except that spinal anaesthesia test is not done

The *pre-operative* preparation when the anterior approach is used will be to prepare the neck and the front of the chest.

When the posterior approach is used the back should be prepared.

Post-operative care is the same as for a case of Lumbar ganglionectomy.

During the operation injury to the pleura might sometimes occur but with endotracheal anaesthesia this is a matter of little importance. When the anterior approach is used, injury to the vessels like the vertebral artery, Internal Jugular and subclavian veins and on the left side Thoracic duct might

occur. In the post-operative period one should watch for evidences of bleeding or for any pneumothorax.

Presacral Neurectomy

This is done in cases of intractable and crippling dysmenorrhoea, inoperable carcinoma of the cervix, some cases of malignant diseases of the bladder and chronic interstitial cystitis to relieve pain.

At the present day the indications for presacral Neurectomy are very few and is found to be good in spasmodic dysmenorrhoea.

The pre-operative and post-operative care are similar to a case of lumbar ganglionectomy.

Hirshprung's disease and severe constipation

The standard operation today is a high lumbar ganglionectomy with removal of 1st and 2nd ganglionic enlargement through a lumbar incision.

It is not yet decided whether both sides should be operated upon. Some have observed that when colonic dilatation is severe on one side, the 1st and 2nd ganglia from the appropriate side should be removed.

The advantage of doing an unilateral operation, if possible, is that excision of the first and second ganglia from both sides will stop ejaculation, though not penile erection.

The success which sympathectomy is likely to have in any given case may first be measured by the induction of spinal anaesthesia to the level T6 and if this is followed by bowel evacuation, sympathectomy is likely to be of benefit.

Barium enema is the next test that is done to find out the size of the colon.

Under spinal anaesthesia, less of the Barium enema can be introduced into the colon and the colon seems to be less dilated.

The pre-operative and post-operative preparation of these cases are similar to that for a case of lumbar ganglionectomy.

Sympathectomy for Essential Hypertension

The aim of sympathectomy for hypertension is to enlarge the blood storage spaces in the abdomen and lower limb and thus lower the blood pressure.

Smithwicks operation of Thoraco-Lumbar Splanchnic sympathectomy is the most complete splanchnic denervation that has been devised for cases of essential hypertension. By this method the sympathetic chain from the 6th dorsal ganglia to the 2nd lumbar together with the greater, lesser and least splanchnics are removed.

The *pre-operative investigations* that are done are:

1. Complete Urine examination.
2. Blood examination.
3. Renal function test.
4. Blood urea and creatinine.
5. I.V.P.
6. X-Ray of the heart and lungs.
7. Plain X-Ray of the abdomen and limbs to find out if there is any calcification of the larger vessels.
8. E.C.G.
9. Opthalmoscopic examination to find out the changes in the eye.
10. The eye changes are graded so that one could determine whether the patient is suitable for operation or not.
11. Sod. Amytal Test.

The contra-indications for operations are:

1. Advanced age.
2. Gross renal disease.
3. Advanced heart disease.
4. Encephalopathy.

5. If the diastolic pressure is very high, above 140, and does not vary with rest in bed or does not fall after 3 doses of Amytal (The Amytal test)—3 gr. every hour, operation is contra-indicated.

The *preparation* before operation will be

1. Abdomen and back to be prepared as for a lumbar ganglionectomy and cervico-dorsal sympathectomy.

2. Blood grouping done and about 1000 c.c. of blood should be ready during operation.

3. Soap and Water enema to be given on the previous day.

4. Pre-anaesthetic medication after consulting the Anaesthetist.

This operation of removal of the Thoracic sympathetic chain from T6-L4 can be done in stages at intervals of 15 days.

Post-operative care will be the same as for a case of Lumbar Ganglionectomy with the following addition.

1. Plain X-Ray chest to find out if there is any evidence of Pneumothorax.

2. Blood pressure to be recorded every 15 minutes till it becomes stationary and shock has been overcome.

3. Post-operative lung complications are avoided by O_2 and CO_2 inhalation.

4. Post-operative infection is treated by antibiotics.

CHAPTER 30

ORTHOPAEDIC SURGERY

This chapter will deal with the general principles of fracture treatment. No attempt therefore will be made to discuss the treatment of every fracture and dislocation in detail. The fate of the injured depends to a large extent upon the initial care which their wounds receive. Skilled competent care may save lives and salvage function even in bad cases, while improper care for even a trivial injury may end in disaster.

After a fracture of a bone, the part becomes swollen, painful and circulatory disturbances occur. The swelling increases rapidly during the first 8-12 hours and any reduction at this late stage may increase the damage to the part. In addition to the fracture, the soft parts round the site like the muscles, nerves, joints, tendons may also be injured. Immediately after a fracture, the patient may have:—

1. Local numbness and paralysis which may last for about 20-30 minutes. This is followed by a swelling which increases in size in about 24 hours.

2. Ecchymosis occurs due to extravasation of blood at the point of injury.

3. Pain is very severe due to swelling and movement of the bone fragments.

4. Careful examination is done to find out if there is any nerve, vascular, tendon or joint injury.

5. X-Ray film is taken to show the type of fracture.

6. If the joint is involved in the fracture, the patient will be complaining of severe pain, and movements at the joint are restricted.

The immediate care of patients who have had a fracture is as follows:

The fracture must be splinted before the patient is moved to the hospital. This first aid treatment will prevent further damage to the soft parts. This also reduces pain and shock.

In the case of injured arm, the first aid consists in tying it across the chest and in cases of injured leg, it is bandaged to the opposite leg. Immobilisation can also be accomplished by the use of wooden planks or sticks.

In the case of injuries to the back, the patient is to be transported in the prone position and in neck injuries in the supine position. As soon as he is hospitalised:

1. Morphia should be given to relieve pain.

2. Haemorrhage is controlled by pressure dressings or bandages or by a tourniquet if the bleeding is very severe from any of the limbs.

3. Shock—This is treated by:

(a) appropriate splinting of the fractured area;

(b) blood transfusion or saline transfusion.

The patient is then transported to the Operating room with extreme care and gentleness. Thus the most important first aid treatment is to splint the fracture before the patient is moved.

The treatment of these fractures would depend upon:

(a) the site of fracture;

(b) the amount and character of the displacement;

(c) whether there has been any vascular or nerve injuries;

(d) whether there is an involvement of the neighbouring joint.

In cases of fractures with displacement, closed reduction is done by traction and after correction, the part is immobilised. In some cases where the deformity is very severe, open reduction may have to be tried. The fractured ends are then brought into apposition and fixation may be done with metal bands or plates or screws.

Many of these fractures are reduced by skin traction but because of complications like irritation and blister formation,

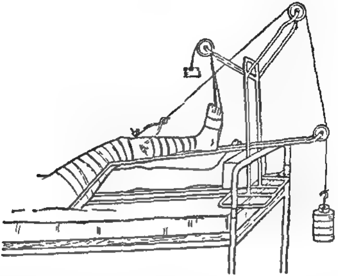


FIG 57(a). Fracture of the femur treated in the Bohler-Braun splint with skeletal traction through the tibial spine using 15 lbs or 20 lbs. The foot of the bed is raised about 18" by blocks. To prevent pressure sores on the heel an adhesive strapping is applied to the forefoot and a 2 lbs. weight is suspended from it over one of the pulleys as shown in diagram.

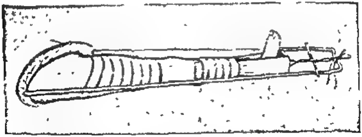


FIG. 57(b) Diagram showing Thomas bed splint for fractures of the shaft of the femur Skin traction is used and adhesive strapping is bound to the limb by soft bandage.

some surgeons prefer skeletal traction. One of the complications following skeletal traction is local infection of the bone although the pin or the wire has been applied with all aseptic precautions. The length of time in traction varies with

the type of fracture and the bone involved. After callus formation has occurred, the traction may be removed and a plaster cast applied. The most widely used method for immobilisation of fractured limb is the application of Plaster of Paris casts. The preparation of the patient before applying the cast is as follows:

The skin of the affected area should be shaved and washed with soap and water. All bony prominences are protected by a small amount of padding and the skin is covered with a stockinet before a skin tight plaster cast is applied. The

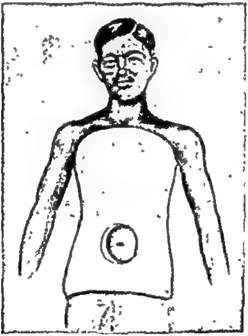


FIG. 58 Diagram showing a body cast with a hole cut out to allow for food intake or distension.

plaster cast should not be tight as it may produce pressure sores or in some cases, it may interfere with the blood circulation of the limb and gangrene might occur.

After the cast has been applied, the part should not be moved as the cast may break and may result in loss of

immobilisation or in a pressure sore. In cases where the patient has a swelling, a plaster mould may be given. This plaster mould may be enough in cases where there is no danger of displacement and in which simple immobilisation is sufficient to maintain proper reduction. If a plaster cast has been applied round the body, a circular window is cut out from the cast over the abdomen so as to provide enough room for distension of the abdomen after taking food. Reduction of these fractures should be made as gently as possible under an anaesthetic. X-Ray films are taken to check the position of the fragments.

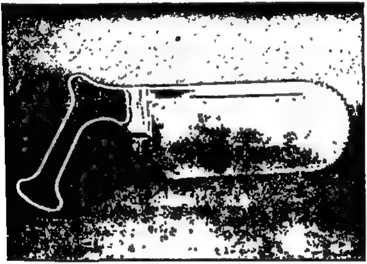


Fig [illegible] (a) Plaster Saw.

The methods of reduction that are available are:

1. Manual traction.
2. Traction and manipulation.
3. Traction suspension.
4. Open reduction should be chosen only when the results by the closed method are not very satisfactory. The decision between open and closed reduction will entirely depend upon the judgement of the orthopaedic surgeon.

After a plaster cast, there is always a danger of swelling increasing at the site of fractures. As a result the plaster cast is split or bivalved with a knife or plaster saw after the plaster is set. The two halves of the plaster cast can be

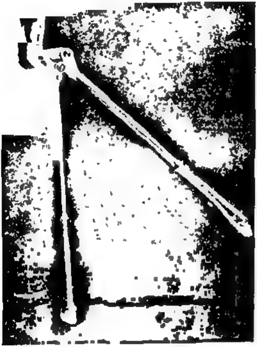


FIG 59(b) (i) Plaster Shears (Stille)

fitted with an elastic bandage or adhesive plaster. If a complete cast has been applied, the patient should be watched for any danger signals like oedema, cyanosis, pain and anaesthesia in the part. *In these cases, no time should be lost in cutting the plaster casts.*

The principles in the treatment of open fractures are as follows:

1. First aid treatment—splinting.
2. Shock must be treated.
3. A.T.S. 3000 units and Anti-gas gangrene serum are given for these patients.

4. X-Ray films must be taken.

5. Operative treatment in the case of compound fractures.

6. Antibiotics.

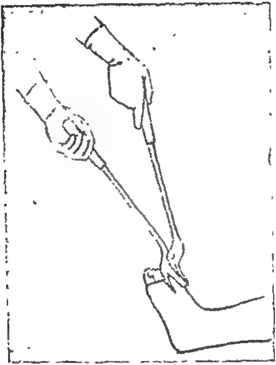


FIG 59(b) (ii) Plaster shears are used to cut plaster.

These open fractures are always an emergency and the treatment must be done as early as possible.

Operative treatment consists in:

(a) reduction of the fracture and immobilisation of fragments.

(b) the wound is covered by a sterile gauze and the skin all round is shaved and cleansed.

Irrigation of the wound with saline is done to remove all dirt; dead and devitalised tissues are excised. Small pieces of bone fragments which are hanging loose are removed. Any

haematoma present there is evacuated Nerves and tendons which have been injured are repaired. The wound edges must be excised. Whether the wound should be closed or left open depends upon:

(a) the type of injury;

(b) the degree of tissue damage and amount of contamination of the part.

(c) the time that has elapsed after the injury.

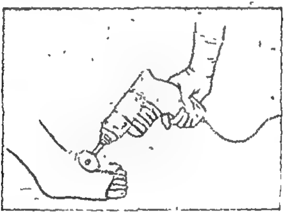


FIG 59(c) Diagram showing method of cutting plaster with an electric saw.

If the wound is clean, it should be closed whenever possible, and this is particularly desirable when the tendons and nerves are exposed If the wound has been badly contaminated, it is advisable to leave it open Antibiotics should be given as a prophylactic in all these cases. The wound should be inspected daily and dressed with Penicillin, Sulphanilamide powder and vaseline gauze Immobilisation should be continued during the whole period so that the fractured ends may unite. In the case of open fractures, reduction can often be obtained by traction passing pins or wires above and below the fracture and incorporating them in plaster cast. Thus, complete immobilisation prevents the development of any infection. Immobilisation is continued till clinical and radiological evidence shows good bony union of the fracture.

Rehabilitation of these individuals should be started as early as possible. Fingers, toes and muscles should be exercised and the unaffected muscles and joints should be used to maintain their tone and function. Adequate surgery is not the sole measure of success in the treatment of these fractures; rehabilitation is an essential adjunct if the end-results

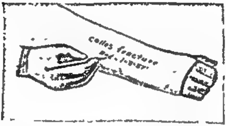


Fig 60 Diagram showing plaster cast applied for a colles fracture. Date of reduction and the diagnosis are written on the plaster cast with an indelible pencil in every case This will show readily the duration of immobilisation.

are to be good. Regaining function after a fracture is often slow but the surgeon can help the patient to return to his usual job by physical therapy and occupational therapy.

Orthopaedic operations

The majority of the orthopaedic operations should be done only after an adequate preparation. The investigations that are done are:

1. Urine examination,
2. Blood examination,
3. Radiological examination,
4. Wasserman reaction,
5. Serum Calcium,
6. Serum alkaline and serum acid phosphatase,
7. Bone biopsy.

Any infection present in the patient is treated before the operation.

Pre-operative preparation:

The skin preparation should be done very carefully, the part being shaved and washed with soap and water. This preparation is done for a couple of days before operation. The shaving of the part to be operated should be done without producing any cuts or abrasions. On the day of operation, the part should be washed with ether soap and cleansed with alcohol and the area covered with sterile dressings.

Post-operative treatment of these cases does not differ from that of any other major operation. Pain is relieved by giving him morphia or barbiturates. In patients who have been operated on the knee, quadriceps exercise is started on the 2nd day of operation. Weight bearing should not be permitted without the consent of the surgeon. Nursing care of these patients is very important, especially when they are lying in bed after a plaster cast or when a traction appliance has been applied. The patient should be made as comfortable as possible and every form of encouragement is given during the long period of treatment which is tedious for the patient. Antibiotics are given during the pre- and post-operative periods.

Adequate rehabilitation of the patient is necessary before he could take his usual job. Thus a close co-operation between the surgeon, the occupational therapy department and the physical therapy department is necessary to get the best result for the patient.

Management of patients lying on plaster beds

Plaster beds are designed to provide good immobilisation of the trunk. This is usually done for cases of:

1. Tuberculosis of the spine or sacro-iliac joints.
2. Certain cases of fracture of the spine.
3. For the fixation of spine and sacro-iliac joints after operations on them.
4. Anterior poliomyelitis and certain other paralysis involving the trunk or abdomen.

The patient is made to lie in the desired position and the posterior shell or bed is constructed to fit the patient. When the patient is lying on the plaster bed an anterior shell also is made so that the patient can be turned on to his face without any movement being possible. The anterior shell is very necessary so that the skin on the back can be attended to by the nurse. Inspection of the back is necessary daily for the first week and later at intervals of increasing length if progress is normal. If there is no anaesthesia in the back turning of the patient can be done once in 4 to 5 weeks. Anaesthesia of the back or limbs demands great attention to prevent pressure sores over sacrum or heel and this can be avoided only by careful and conscientious nursing. When the patient has been turned on to the face, the back should be washed with soap and water and rubbed with spirit. After it is dry, dusting powder is applied. If the patient is a paraplegic, the heels must be watched for signs of pressure sores and the knee must always be kept in a 5 or 10 degrees flexion to prevent stretching of ligaments. During the period of immobilisation the patient needs some sort of an occupation to keep the mind always pre-occupied so that he does not worry about his disease. The patient is encouraged to read books or allowed to do some sort of a work. Sometimes a radio or a television programme may help him to forget the boredom of lying in bed. The management of these patients demands great attention and the help of the nurse, doctor and the occupational therapeutist pays handsome dividends in the long run.

CHAPTER 31

AMPUTATIONS

Amputation is usually done in cases of:

1. Gangrene of the toes or foot;

2. Peripheral vascular diseases;

3. Malignant diseases of the bones or soft parts in the limbs.

4. Crushed injuries with comminution of the bones.

The *pre-operative* investigations are:

1. Blood examination.

2. Urine examination to find out if the patient is a diabetic.

3. If he is a diabetic, blood sugar estimation.

4. In cases of malignant tumours of the bones, an X-ray of the chest should be taken for evidence of any secondaries in the lung.

5 If the gangrene of the limb is due to peripheral vascular disease, an arteriogram should be done to find out the level of block and the degree of collateral circulation.

6 An X-ray of the part should be taken to ascertain:

(a) the nature of the injury;
(b) the nature of the bone lesion;
(c) any calcification of the vessels

7. If the patient complains of any pain in other bones, X-rays of those bones are taken to find out if there is any metastasis.

8. W.R. and Kahn reactions.

9. Blood urea and E.C.G, if necessary,

Before performing any amputation, the diabetic condition should be controlled if present.

The site of amputation should be determined and the part prepared.

The anaesthesia given may be either gas and oxygen or local or, in some cases, spinal.

Blood transfusion may be necessary in some cases at the time of operation.

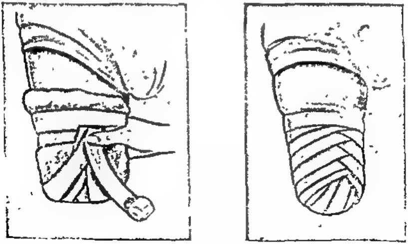
Post-operative care:

Liquid diet for the first two days, semi-solid diet for the next three days, and on the 7th day, normal diet.

Drainage tube should be removed on the 2nd or 3rd day depending upon the amount of drainage.

A tourniquet should be kept handy for application in cases of reactionary or secondary haemorrhage.

Skin sutures are removed on the 10th day. The amputation stump should be kept in the best possible position and one should prevent any flexion contracture, especially at the knee, hip or elbow and adduction contracture at the shoulder.



(a) (b)

FIG. 61 (a & b) Diagrams showing the method of applying bandage for the stump.

The dressings for the wound need not be changed till the sutures are removed. Chemotherapy and antibiotics are given to control infection.

CHAPTER 31

AMPUTATIONS

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   (c) any calcification of the vessels.

7. If the patient complains of any pain in other bones, X-rays of those bones are taken to find out if there is any metastasis.

8. W.R. and Kahn reactions.

9. Blood urea and E.C.G, if necessary,

Before performing any amputation, the diabetic condition should be controlled if present.

should be combated by blood transfusion and the patient's general health is improved so that he could stand this major surgical procedure.

The skin over the back, abdomen, gluteal region, thighs and the perineal region should be prepared in the usual manner. During the operation, the patient is given blood transfusion.

Post-operative care consists of:

1. Treatment of shock.

2. The drainage tube left in the wound should be shortened after 48 hours and removed on the 3rd or 4th day.

3. An indwelling catheter should be left in the bladder and connected to a tidal drainage apparatus.

The catheter draining the bladder should be removed after a week or ten days by which time the patient will be able to pass urine normally. The patient must be turned from side to side by the nurse to prevent any pressure sores occurring over the sacrum or the back. Just before the patient is discharged, he is fitted with a suitable prosthesis and is taught how to walk carefully with a stick.

Amputation through the thigh or leg

This is done for conditions mentioned above The same pre-operative and post-operative care should be observed.

Inter scapular thoracic amputations

Removal of the upper limb with the scapula is usually indicated in malignant disease of the upper end of humerus involving the shoulder joint or the muscles around it or of the scapula itself.

Patient's general health must be improved and the same pre-operative care mentioned above must be adopted.

During the operation, patient must have blood transfusion and in the post-operative period, he must be on antibiotics.

In cases where amputation is done for crushed injuries, the shock and the loss of blood should be immediately combated. The bleeding should be controlled by a tourniquet and the pain is relieved by morphia. A.T.S. and Anti-gas gangrene serum are also given.

The following investigations are done as soon as the patient is admitted:

1. Pulse rate recorded every half an hour.
2. Blood pressure recorded every half an hour till the shock and blood loss has been corrected.
3. Haemoglobin estimation
4. Urine examination to find out if the patient is a diabetic.
5. X-ray of the injured part to find out the nature of the injury.

If after examination of the injured part it is found that an amputation is necessary, the patients consent or that of his relatives should be taken in writing.

When the patient is under an anaesthetic, the part should be prepared and then, amputation should be done. Blood transfusion should be given during the operation. Patient should have antibiotics after the operation. The wound should be carefully examined to find out if there is any gas infection during the post-operative period.

Inter innomino abdominal amputation

Amputation of the lower limb with the innominate bone is usually carried out for cases of:

1. Sarcoma of the pelvic bones;
2. Malignant tumours of the upper end of femur;
3. Large benign growths of the pelvis.

The pre-operative investigations that have been mentioned above should be carried out in these cases. The patient must be given Penicillin for two or three days. Anaemia

CHAPTER 32

E.N.T. SURGERY

With the development of this speciality, the general surgeon is very rarely asked to treat the diseases of the ear, nose and throat. The house surgeon working in the speciality may be required to investigate and treat cases that have to undergo operations on the ear, nose or throat. In this chapter, no attempt is made to deal with the whole of this speciality.

Tonsillectomy may be done under local or general anaesthesia. If the patient has Acute infection of the tonsil, the operation must be deferred until the inflammation has subsided. Premedication is given according to the instructions of the anaesthetist which may be Morphia and Atropine in the case of adults, Luminal or Paraldehyde in the case of children, the dose varying according to the age of the patient. If local anaesthesia is to be used, the patient should be tested for sensitivity two days before.

Pre-operatively, the patient is given Penicillin or Sulpha drugs. A general examination of the patient to find out if he is suffering from any cardiac or kidney disease is done. Urine and blood examination and a bleeding and clotting time estimation may be done. Pre-operative X-ray of the chest is taken to note the condition of the lungs and of any possibility of an enlarged Thymus.

After the operation, the patient must be watched carefully till he recovers from the anaesthesia. All the secretions in the mouth must be removed by a sucker and the patient should be lying down with the head turned to one side. For the first 8 hours, the patient is not allowed to swallow anything by mouth. After this, he is encouraged to take some fluids. Mouth washes and gargling of the throat either with Condys or Saline solution should be done before and after

The drainage tube is removed on the third day and stitches are removed on the 10th or 11th day. A suitable prosthesis must be fitted but it may not be of much use to the patient.

Amputation of the fore arm or upper arm

For indications mentioned above, such amputations may have to be done. After these operations, a suitable prosthesis must be fitted. After amputation, the patient must be encouraged to attend the rehabilitation department so as to enable him to pursue an occupation and thus become a useful member of his family and community.

Empyema of the Maxillary Antrum is another condition which has to be treated sometimes by a general surgeon. Intranasal antrostomy or Caldwell Luks operation has to be done. After irrigations of the antrum, inhalations with steam daily for about 3 days is advised. Sometimes, the antrum may have to be irrigated with sterile saline solution morning and evening. The patient is kept under an umbrella of antibiotics.

Acute Mastoiditis

For acute infection of the mastoid, patient is given chemotherapy or antibiotic drugs. If the infection does not subside and pus formation has occurred, the mastoid region is prepared in the usual manner for an operation.

FIG. 62 The Mastoid Bandage

The post-operative care after mastoidectomy is as follows:

The dressings are changed on the 2nd or 3rd day. Post-operative pain is relieved by morphia. Severe headache, vomiting or a stiff neck are serious complications and suggest an intracranial extension of the infection. Penicillin is of value in the treatment of this condition. The drainage tube that has been kept in the post-aural wound can be shortened

every feed. The diet may be ice cream or liquids on the first day. On the 2nd day, the patient may be given some jelly and soft food and thereafter the diet increased gradually.

At bed time, in the case of adults, Morphia may be given on the 1st day to give a good night's rest.

The important complications are:

1. *Haemorrhage.* This may be immediately after the operation or after some hours. The blood clots are all removed and the tonsillar fossa is plugged with a small sponge saturated with adrenalin solution (1 in 1000). If any vessel is seen spurting, it must be caught and ligated Sometimes a plug of cotton wool moistened in a solution of Liq. Ferri Perchloride may stop the bleeding. In some cases, if it is due to a little oozing, a gel foam pack may be used to control the bleeding. Sometimes, the bleeding may be from the adenoid region which is controlled by the usual methods mentioned above but if it is not possible to control it, a nasopharyngeal pack has to be inserted.

2. *Infection* is another important complication that may occur in the post-operative period and can be controlled by chemotherapy or antibiotics.

3. In some cases, *lung complications* are likely to occur and these may be due to aspiration of infected foreign material into the lower respiratory passages. Patient may therefore develop either a lobar pneumonia or a bronchopneumonia and, in some cases, abscess of the lung. Examination of the patient for evidence of any leucocytosis and an X-ray of the chest may confirm the diagnosis

Peritonsillar Abscess

In this condition, the patient is given chemotherapy or antibiotics, hot gargles and fomentations to the enlarged glands in the neck and if an abscess should develop, it is opened, care being taken to suck out the pus. Hot gargles and mouth washes are continued Tonsillectomy is advised after the condition has subsided and that is 2 to 3 months later.

is not able to breathe, stenosis of the larynx should be suspected and a laryngoscopic examination made. In persons where the tracheotomy is done as an emergency to tide over the crisis of respiratory obstruction, the tube can be removed after 10 days. If the patient is to have a permanent tracheostomy the tube is changed every week.

Total Laryngectomy

This operation, first performed by Bilroth, soon became unpopular because of certain post-operative complications, the most important one being aspiration of blood and secretions into the lungs resulting in septic pneumonia. The other complications were shock, haemorrhage and sepsis. Some of them developed severe mania or melancholia due to losing their voice. Because of these drawbacks, this operation was not favoured by many surgeons for sometime. Today, the operation of complete laryngectomy is more successful and done in cases of intrinsic cancer of the larynx. Even when the lymphatic glands are involved, the operation has been successful in a large number of cases when block dissection of glands in the neck is done along with laryngectomy. Thus, with improved technique and proper pre-operative and post-operative care, the surgical mortality has been reduced to 2 or 3%.

Preparation: The patient's general condition is improved by correcting anaemia, hypoproteinaemia and hypovitaminosis. All infection in the teeth and tonsils are cleared by proper oral hygiene and by removal of carious teeth.

The neck of the patient is prepared in the usual way for operation. If the patient has got any respiratory embarrassment, a preliminary tracheotomy is done.

After care: The care of these patients after the operation demands the greatest attention of both the surgeon and the nurse.

1. *Shock*. This is combated during the operation and after by blood transfusion or by plasma and saline transfusions. The patient should be nursed in a sitting position

as the drainage becomes less. Sutures are removed on the 10th day.

Tracheotomy

This is generally done as an emergency operation for an acute obstruction to respiration as in cases like (1) diphtheria; (2) Acute laryngitis, due to infection, inhalation of steam or gases or trauma; (3) injuries to cricoid and thyroid cartilages with severe degree of oedema.

Tracheotomy may be done as a preliminary in the following conditions:—

1. Removal of the upper jaw.

2. Partial or total glossectomy.

3 In some cases of cut throat or gunshot wound involving the air passages when blood may enter the trachea.

4. In cases of tumours of the thyroid or thymus gland which have produced a severe compression of trachea giving rise to difficulty in breathing.

5. Bilateral abductor paralysis which may occur in tabes or toxic neuritis or diphtheria.

The skin of the neck is prepared and under local anaesthesia, the operation is done as quickly as possible. The tracheotomy tube must fit well without tilting and must be fixed by tying the tapes firmly round the neck. A thin layer of Penicillin tulle or vaseline gauze is passed under the tracheotomy shield so as to embrace the tube. The inner tube is changed frequently as it may become covered by thick mucus or phlegm A thin layer of gauze is placed over the tracheotomy tube to prevent any dust particles getting into the respiratory tract. Morphia and atropine are contraindicated in these cases. The nurse should constantly check on the tracheotomy tube and any secretions blocking it, should be removed by a sucker. The diet of the patients must be liquid for the first 2 or 3 days and thereafter, semi-solid. Before removal of the tracheotomy tube, it must be corked to see whether the child is able to breathe properly. If it

The usual pre-operative care that has been mentioned for laryngectomy should be adopted for these cases also. Pharyngoscopic and laryngoscopic examination, and a biopsy of the growth should be done as a routine.

As the patient is not able to take any solid or liquid feeds due to dysphagia, a temporary gastrostomy is done to improve his general health before the major operation.

Post-operative care:

1. *Shock.* This is treated by blood transfusion and the fluid balance is maintained by giving intravenous fluids.

2. *Infection.* This is controlled by keeping the patient under an umbrella of antibiotics.

3 *Diet.* After 24 hours, the patient is given liquid feeds through the gastrostomy tube.

4. *Care of the wound.* This is similar to the after care that has been mentioned for cases of total laryngectomy. The tracheotomy tube should be carefully inspected by the nurse and all mucous secretions present should be aspirated by a sucker. All secretions from the mouth that come out through the pharyngeal opening above should be removed by a sucker, and the skin between the upper pharyngeal and the oesophageal openings should be kept as dry as possible. When the healing is sufficiently advanced, i e after 6 weeks, a plastic reconstruction of the pharynx may be attempted. After the skin tube that has been made between the upper pharyngeal opening and the oesophageal opening has healed, the patient is allowed to swallow normally and the gastrostomy tube is removed. The tracheostomy tube must be worn both day and night. In the day time, it may be covered by a thin gauze. All patients who have been deprived of the laryngeal voice should have instructions from a voice trainer. A determined and prolonged effort by the patient to train himself may help him to speak without much difficulty. If he cannot do that he may have to be trained to speak with the help of an artificial Larynx.

which facilitates breathing and expectoration of blood and mucus. This also makes nursing easier and change of dressings round the neck can be done as often as possible. When the dressings are changed, care is taken to see that no blood, mucus or secretions fall into the trachea. A suction pump should be ready for clearing up the tracheotomy tube and for removing any secretions from the trachea when the wound is being dressed.

2. *Feeding.* A Ryle's tube is passed through the nose and all nourishment is given through the tube and this should be retained until deglutition is satisfactory. During the first two days after operation, the patient may have to be given fluids intravenously to supply the necessary calories and maintain fluid balance. After 48 hours, the patient is fed through the Ryle's tube Milk, Horlicks, Ovaltine, Coffee, Soup and fruit juice can be given through the Ryle's tube. Vitamins are given parenterally every day. By about the 15th day, the patient may be able to swallow liquid nourishment without the Ryle's tube. During the post-operative period, the patient must do deep breathing exercises to ventilate the lungs and he must be encouraged to cough out the secretions, which may be removed by a sucker. The patient is put on antibiotics. After the wound has healed, the tracheotomy tube may be removed and a fresh one inserted. The next important step which the surgeon should take is to rehabilitate the individual and train him to speak in a normal manner The patient should be taught to speak properly and should not be allowed to whisper. This part of the postoperative care is very important from the patient's point of view as it will help him to get on in life without much of a disability.

Pharyngo-Laryngectomy

Pharyngo-laryngectomy is a severe mutilating operation done for cases of cancer involving the back of the larynx and the lateral or posterior pharyngeal walls In this operation, a complete removal of the larynx and of the pharynx is done. The patient is given a permanent tracheostomy.

There is usually some oedema over the mandible and a slight drooping of the angle of the mouth seen after operation. This recovers in about 4 to 6 weeks. The stitches are removed on the 8th day.

Pharyngeal Diverticulum

A diverticulum of the pharynx originates as a protrusion of the mucous membrane through the posterior wall of the pharynx in the midline. This usually has a partial covering of muscle fibres acquired from the inferior constrictor when it is small. As it increases in size, it becomes flask shaped and descends behind the oesophagus and is situated in the space between the pre-tracheal and pre-vertebral fascia.

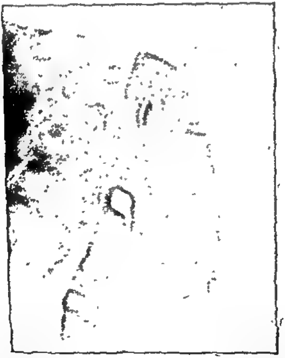

Fig. 63(a) Showing the Pharyngeal pouch filled with Barium meal. Lateral view of the neck to show the pouch clearly.

When the patient takes food, most of it goes into the diverticulum and as the diverticulum increases in size, it presses upon the upper part of the oesophagus and the patient com-

Block Dissection of the Neck

This operation is done in cases of cancer of the tongue, lip, cheek or pharynx, as the metastasis in the lymph glands respond very poorly to deep X-ray therapy unlike the primary lesion.

By "block dissection of the neck" is meant the removal of all upper and lower deep cervical lymph glands, sub maxillary salivary gland, sub mental and sub maxillary group of lymph glands and removal of sterno mastoid, omohyoid and digastric group of muscles with the internal and external jugular veins. If Block dissection is done on both sides the internal jugular vien on one side only should be removed.

Contraindications for surgery are:

1. If the general health is poor.

2. If the lymph glands are hard and fixed, the result of operation will be disappointing as local recurrence is likely to occur.

Bilateral block dissection is indicated in cases when palpable lymph glands are present on both sides. This operation should always be done in two stages, the interval being 2 to 4 weeks between the two operations.

Pre-operative preparation consists in improving the general health by giving vitamins and correcting any anaemia present by blood transfusions. The cardiac and respiratory systems should be checked before operation and an X-ray of the lungs taken as a routine.

The neck is prepared in the usual way and under general anaesthesia, the operation is done.

Post-operatively, the rubber drain is removed after 48 hours. Antibiotics are given for 5 or [illegible] days. Shock is combated by the usual methods. Patient may be on liquid diet for about 24 to 48 hours, thereafter changed on to solid or semi-solid diet.

There is usually some oedema over the mandible and a slight drooping of the angle of the mouth seen after operation. This recovers in about 4 to 5 weeks. The stitches are removed on the 8th day.

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FIG 63(a) Showing the Pharyngeal pouch filled with Barium meal. Lateral view of the neck to show the pouch clearly.

When the patient takes food, most of it goes into the diverticulum and as the diverticulum increases in size, it presses upon the upper part of the oesophagus and the patient com-

plains of difficulty in swallowing. Stagnation of food and saliva in the diverticulum may result in ulceration of its walls and in some cases, may lead to perforation with abscess formation. Sometimes, aspiration of the contents present in the diverticulum into the lung may result in a lung abscess or pneumonia.

Investigations are as follows.

1. History of the patient together with the clinical findings is suggestive of the above condition.

2. Barium swallow and X-ray in the antero-posterior and lateral planes. This will show the large pouch filled with the barium.

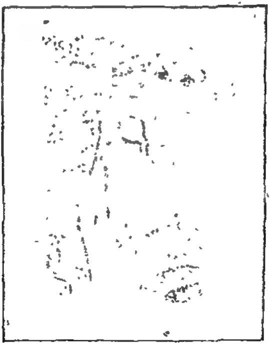

FIG. 63 (b) Showing the Barium meal filling the Pharyngeal Pouch.

3. Endoscopic examination may be necessary if the pouch shows a filling defect on X-ray examination.

Preparation of the patient:

1. Most of these patients are emaciated and their general health must be improved before operation. In some cases, a preliminary gastrostomy may be necessary to improve the general health.

2. The interior of the diverticulum should be washed with saline so as to clear up all infection.

3. Antibiotics are given as a routine.

The operation can be done in one or two stages. In the Lahey clinic, they are strongly in favour of two stage removal, the second stage being done seven days later. They are of opinion that in a one-stage procedure, leakage is likely to occur in spite of good exposure, accuracy of ligation and the use of modern antibiotics. With the two stage procedure, they are emphatic that no recurrence occurs in spite of the inconvenience to the patient to undergo anaesthesia for the second time. The wound heals quickly and without complications.

Post-operative therapy consists of:

1. Intravenous glucose or saline for the first 48 hours.
2. Nothing is given by mouth.
3. After 48 hours, sterilised fluids may be swallowed slowly.
4. Antibiotics for [illegible] to 7 days.

In cases where the operation has been done in one stage, no feeds are given by mouth for five to six days. Nutrition is maintained by intravenous glucose and saline. If the patient has a gastrostomy, feeding may be continued during the post-operative period. After the sixth day, small quantities of fluid are given by mouth.

Complications:

1. Fistula formation. This is more likely to occur after a one stage operation and it takes about [illegible] to 6 weeks to heal.
2. Infection in the neck and mediastinum must be combated by antibiotics.

CHAPTER 33

PLASTIC SURGERY

Plastic surgery is a very ancient art and for many centuries, attempts have been made by surgeons to reconstruct parts lost by accident or disease and to supply or correct features missing or deformed from congenital abnormality. The early workers in plastic surgery met with little encouragement, yet in spite of this, after the two great Wars, astonishing progress has been made. Indeed, one doubts whether any other branch of surgery has undergone so rapid an advance in such a short period.

In this chapter, no attempt will be made to describe the operative technique for deformities of the face, nose, ear or mouth and other parts of the body but only the general principles involved in the preparation of these patients and the post-operative care.

Pre-operative preparation of the patient.

1. Detailed examination of the general health of the patient.
2. Routine blood tests—blood cell counts.
3. Urine examination.

If the patient has any acute infections (like acute tonsilitis or acute otitis media), malnutrition, syphilis and haemophilia, operation is contraindicated.

In all cases, a photograph of the deformity must be taken so that the surgeon can figure out the type of reconstructive work that he has to do to correct the deformity.

Two things are essential in plastic work:

1. Complete asepsis;
2. Gentleness in the handling of tissues.

An antiseptic dye like 5% Brilliant green in Dettol is employed by some surgeons to mark out the type of incision that is to be made. Preparation of the part must be done very carefully:

1. The skin must be shaved.

2. Mechanical cleaning with soap and water several times over a period of 24 hours before operation.

3. 70% alcohol is used for cleaning.

4. Ether may also be used to clean the part.

5. A light sterile gauze dressing is used to cover the part prepared.

6. The donor area is similarly prepared, when necessary.

Various types of grafts are being used to cover defects or raw areas on the body. Two types of grafts which are popular are the Reverdin or Pinch graft and the other, Thiersch graft. The other types of graft are a full thickness skin graft of Wolfe-Krause and Pedicle graft. In cases of Pinch grafts and Thiersch grafts, they are immediately transferred to the prepared site and allowed to rest on its exudations. Some surgeons cover it with warm saline gauze and apply gentle pressure. If the graft is a fairly big one, short stab wounds are made in it to allow the serum to escape so that the graft is in firm contact over the recipient area. Absolute immobilisation of the grafted area is essential during healing, and the dressing should remain untouched for at least 6 to 8 days, unless infection or other untoward developments occur. After the 10th day, movement, physio-therapy and occupational therapy are instituted and continued for 6 months. In the case of pedicle flaps, complete immobilisation of both recipient and donor areas must be maintained. Plaster of paris casing or simple adhesive dressing or a metal appliance is constructed so that immobilisation is perfect. After the flap has been sutured to the recipient area, firm and uniform pressure dressings should be applied. To achieve success in this method of grafting, the recipient area

must be free from sepsis and the flap taken from a healthy part of the body which has a rich supply of blood. Colour, thickness and texture of these flaps must be considered before transferring to areas like the face. A hairy area cannot be used as flaps which are going to be grafted on to the face. Some surgeons use a tulle gras dressing to cover the grafts; others use a Penicillin tulle, but the main principle is after application of this dressing, an absorbent material is placed and a pressure dressing provided by crepe bandage or adhesive strapping. When the dressings are removed, the grafts which have taken are pink and firmly adherent while the others are grey or pearly white and separate easily.

Post-operatively, parenteral administration of antibiotics are given for about 4-5 days.

Hare Lip

This is the most common of all congenital defects of the lip. Careful preparation is essential.

1. Mouth and teeth should be cleansed with warm water and mild antiseptics, every time after a feed for a few days before the operation.

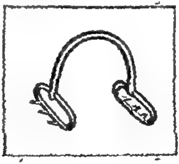

FIG. 64(a) Logan's Traction Bow.

2. Infections in the nose and throat must be controlled before operation and throat swabs taken to check on it.

3. Respiratory system must be carefully examined for any infection in the lungs, as the child may easily develop post-operative lung complications like bronchitis or bronchopneumonia.

Operations for hare lip should be performed at the earliest possible moment and the best time is between 3 weeks and 3 months after birth.

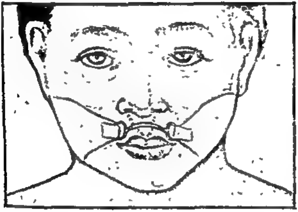

FIG. 64(b) Logan's Traction Bow in position after repair of cleft lip.

After the operation, a Logan's tension bow is applied to prevent the suture line giving way when the child cries. This device leaves the suture line exposed for periodical cleansing and for later removal of the stitches. With the Logan's bow in position, the sutures can be removed on the 3rd day. No skin stitches must be left after the 5th day. When the child leaves the hospital, the mother is instructed to "knead" the scar line with a clean finger greased with lanoline or cold cream.

Cleft Palate

The repair of the cleft must be completed before the child attempts to make serious use of its defective speech mechanism. The best time to operate is when the child is about 18 months to 2 years. The child must be in good health when this operation is done and every effort should be made

to build up the infant's resistance. Frail children are unsuitable for operation.

The usual pre-operative care like attention to the nose, ear, throat in cases of infection and a check up of the respiratory system should be a routine.

After the operation, the child should be watched carefully for evidence of any respiratory obstruction. A traction stitch should always be left in the tip of the tongue for use during the early stage of recovery from the anaesthetic. If the palate suture line fails, a secondary repair can be done only after 6 months. The success of the operation depends upon how well the child is able to speak and hence voice training or speech training must be provided. Thus defective speech mechanism can be corrected by voice trainers and the child may be able to talk clearly.

CHAPTER [illegible]

PEDIATRIC SURGERY

Recent advances in the care of infants have greatly contributed for successful developments in pediatric surgery. The knowledge that has been gained within the last decade or two in the pre-operative and post-operative care of infants has contributed much to this development. A surgeon who is desirous of undertaking an operation on an infant should act in close co-operation with a pediatrician in the management of the case.

General care:

Unless the case is urgent, attempts should be made to get the child acclimatised to the hospital atmosphere before operation is done.

Diet of the infant is according to the formula prescribed by the pediatrician in consultation with the surgeon. The last feed should be at least 3 to 4 hours before operation and should be in the nature of glucose water or sugar water or orange juice. There is no possibility of any aspiration of vomit during or after anaesthesia as the stomach becomes empty after two hours. Older children can be given a normal feed at dinner time and, in the early hours of the morning, a cup of weak tea or water or orange juice is permitted if the operation is to be done at 10 or 11 A.M.

Drugs:

Antibiotic and chemotherapeutic drugs play a great part in the success of this surgery and the surgeon undertakes these major surgical procedures to-day with greater confidence. For operations on the urinary tract, the broad spectrum antibiotics like Terramycin and Aureomycin or Furadantin are to be given. In operations on the colon, the preoperative preparation should be as in adults and colonic irri-

to build up the infant's resistance. Frail children are unsuitable for operation.

The usual pre-operative care like attention to the nose, ear, throat in cases of infection and a check up of the respiratory system should be a routine.

After the operation, the child should be watched carefully for evidence of any respiratory obstruction. A traction stitch should always be left in the tip of the tongue for use during the early stage of recovery from the anaesthetic. If the palate suture line fails, a secondary repair can be done only after 6 months. The success of the operation depends upon how well the child is able to speak and hence voice training or speech training must be provided. Thus defective speech mechanism can be corrected by voice trainers and the child may be able to talk clearly.

2. Enema has to be given for these infants the evening before the operation. If the child is very nervous, this can be omitted till the morning of operation. If after the enema, the fluid gets retained, a rectal catheter is passed and fluid completely drained. This colonic preparation assumes great importance especially when resections of the bowel are to be done such as in Hirchsprung's disease. In this disease, the bowel has to be completely cleaned which may take a few days before surgery is undertaken.

Pre-operative treatment:

Pain: Pain is a factor which varies from patient to patient and when a child has pain, a good sedative in the form of Phenobarbitone or Paraldehyde may be given. For a highly strong child, barbiturates every six to eight hours is very helpful. When the child is taken to the operating room, it must be sleeping or at least drowsy so that it does not get frightened on seeing the operating room personnel.

The pre-anaesthetic medication should be done after consultation with the anaesthetist. In the operation room, the child should be covered with a towel and in the cold weather, warm blankets may be needed. For premature infants, the limbs are covered by cotton and wrapped by a bandage to conserve body heat. The stomach should be emptied by passing a Ryle's tube or a Levine tube prior to induction of anaesthesia.

Fluids: Before any major procedure is undertaken, intravenous administration of fluids should be started. It takes about 5-10 minutes to expose an ankle vein and start the intravenous drip. This intravenous fluid can be changed to blood as the operation proceeds. Of late, instead of passing a cannula into the vein, a polyethylene plastic tube No. 19 for babies and No. 14 for children is used. When intravenous fluid is being administered for these infants, an accurate record of the number of cubic centimeters of fluid administered should be made. Hence a graduated bottle will be of great help for adminis-

gations with debacterialisation of the bowels by Sulphathalidine or Streptomycin or Chlorostrep is necessary before any elective surgery is undertaken.

Dosage:

The twentyfour hour dosage of these drugs for the infants has to be calculated according to the body weight; Terramycin 20 mgms. per lb. body weight orally; 5 mgms. per lb. parenterally; Aureomycin 10 mgms. per lb. body weight orally and 3 mgms. per lb. parenterally. Furadantin 5 to 8 mgm. per kilogram of body weight per 24 hrs.

Penicillin 10,000 units per lb. body weight; Sulphathalidine 100 mgms. per lb. body weight.

Vitamin therapy: Vitamin C should be given by mouth or by subcutaneous injection daily as it promotes wound healing and prevents post-operative wound dehiscence. The *dosage of Vitamin C by mouth will be about 50—100 mgms.*

Vitamin K is necessary in all new-born infants, as these babies have a mild degree of Hypo-Prothrombinaemia after birth. About 5 mgms. daily will be necessary for these infants parenterally.

Nutrition: Interference with the nutrition of the infant brings about a depletion of glycogen storage in the liver. Hence dehydration due to fever, vomiting and diarrhoea must be corrected by parenteral administration of fluids. Electrolyte imbalance also has to be corrected by intravenous fluid administration.

Anaemia: Anaemia in infants can be treated by giving iron by mouth and by small pre-operative blood transfusions. If the Haemoglobin is below 60%, operation on these infants is risky. In cases where extensive operations have to be done, blood must be available during the operation for immediate transfusion.

Preparation for operation:

1. The preparation of the area of operation is on the same lines as that suggested for adults.

One important disadvantage noted after antibiotic therapy is the development of thrush and, if it occurs, the drug should be stopped. If the surgeon still feels that the infection has to be combatted, chemotherapeutic drugs are to be started. In cases of peritonitis, Streptomycin, Terramycin and Aureomycin have been found to yield satisfactory results. If the child is having tuberculous infection, Streptomycin and P.A.S. in doses of [illegible] mgms. per lb. body weight every 24 hours is given. The other antibiotics which have come into the field like Polymixin and Neomycin have been found to be not suitable when given parenterally; but when applied topically, they are safe. Bacitracin is very useful in the treatment of Penicillin resistant staphylococcal infections.

Post-operative vomiting:

This is quite common in infants and children after an abdominal operation. As a result of the debilitated state of the child, aspiration of the vomit is likely to occur and lung complications may result. Therefore, vomiting should be prevented or kept at a minimum by a gastric suction tube. For older children, a Levine or a Ryle's tube may be employed.

Intake and output should be carefully recorded and the colour of the aspirated material will give an idea when the Ryle's tube can be removed. The nurse should have a careful watch on the Ryle's tube and see that it is functioning properly without getting blocked. Intestinal distension can be prevented or reduced by having a gastric suction employed till the peristaltic action returns and flatus is passed per rectum. Drugs like Prostigmine or Calcium Pantothenate may be occasionally used if the patient is having a mild ileus. If the patient has had any intestinal anastamosis, these drugs are contraindicated.

Abdominal distension can also be reduced by passing a flatus tube every 4 or 6 hours.

Post-operative diet: Infants are started on plain water and sweetened water after six hours. The pre-operative feeding schedule can be started 12 hours after operation.

tering these fluids. Just below the dripper, a three-way stop-cock is attached so that at any time, blood or plasma or saline can be pumped into the vein. During the operation, the amount of blood loss can be calculated by weighing the soiled sponges. This will help the surgeon and the anaesthetist to replace the blood lost accurately.

Infection: A child is very susceptible to infection; hence care must be taken to see that it has no bronchitis, tonsillitis, pharyngitis or ear infection. If the child is having slight fever with infection of the respiratory tract, the operation should be postponed. After the operation, prolonged hospitalisation of these children is not advisable as infectious fevers and other diseases that are in the hospital might pass on to the child especially when its general health is not too good.

After operation, the child must be given sedatives "by the clock" and the dosage of the drug should be calculated very carefully so that the child will be quiet and have complete rest which is so essential for the success of the operation. For older children, morphia can be used. To prevent the child from removing the bandages, the arms should be kept at extension at the elbow by means of a splint. This is particularly necessary when operations for cleft palate and harelip are done. It is desirable that the arms and legs are splinted and tied to the bed specially when intravenous fluids are being given.

For abdominal operations, the dressings can be kept in place by adhesive tapes. Great care must be taken by the nurse and the doctor to see that the infant or child does not meddle with the operated area As soon as the child has been brought to the Ward, a nurse should be in constant attendance to watch the child as some complications are likely to set in suddenly, which may end fatally. Aspiration of the vomit or the tongue falling back or in operations of the mouth, a large clot of blood collecting in the pharynx may all be responsible for sudden collapse. A sucker, infant's laryngoscope, endotracheal tubes, a tongue forceps and swabs should be handy to meet such emergencies. Post-operatively, the child is given necessary antibiotics or chemotherapeutic drugs.

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Abdominal distension can also be reduced by passing [illegible] flatus tube every 4 or [illegible] hours.

Post-operative diet: Infants are started on plain water and sweetened water after six hours. The pre-operative feeding schedule can be started 12 hours after operation.

In premature infants, the feed can be given by the drip method through a small tube passed into the stomach, the feed being according to the formula prescribed. A small sized polyethylene tube is passed through the nose into the stomach in older children and a high protein, high caloric feeding is given. Vitamins should be given daily to the infants; the daily dose for infants should contain Vitamin A, 5000 units, Vitamin D, 1000 units, Thiamine HCl. 1 mgm., Riboflavin 0·5 mgm., Vitamin C, 50 mgms., Nicotinamide 2 mgms. These can be added to the feeds during the day.

Fluid therapy:

Many of the operations like Herniotomies, excision of cysts or cutaneous lesions, do not require any intravenous or hypodermic administration of fluids. As soon as the nausea or vomiting subsides, the child begins to take fluids by mouth after operation. In those cases where the child has severe vomiting or diarrhoea or in cases where there is intestinal distension and suction syphonage has been adopted, a child can be kept in better condition if fluid balance is corrected as early as possible. In some surgical conditions, fluids have to be given very carefully especially when the renal function is not good. The co-operation between the pediatrician and the surgeon is essential when fluid administration is done by the intravenous or subcutaneous route. Fluid therapy may save the life of an infant but, if overdone, may end fatally. Fluids were administered per rectum in the past but this has been largely replaced by Venoclysis or Hypodermoclysis. The advantage is that the surgeon knows how much of fluid has been given for these infants. Fluids administered through the subcutaneous route should be either normal saline or a mixture of one part of physiological saline and one part of 5% glucose in water. Stronger solution than this is dangerous to the infant. For rapid absorption of this fluid, Hyaluronidase is added to these solutions and 50 c.c. per lb. of body weight is the maximum that should be given by the hypodermic route. For older children, intravenous fluids can be administered and the house officers must be prepared to expose

the vein in the antecubital space or on the anteromedial aspect of the ankle for this purpose, so that a child which is critically ill in the post-operative period can be saved. The veins on the infant's scalp can sometimes be used for intravenous therapy. Fluids should never be given through the superior sagital sinus or the femoral vein, as it is likely to injure the nearby structures. The amount of fluid that can be given for an infant should not be more than 10 c.c. per lb. body weight, and this can be repeated twice in 24 hours, and should be given slowly. Blood transfusion may be necessary after some of the major operations and the amount of blood given to these infants should not be more than 10 c.c. per lb. body weight at any one time. If the child is hypoproteinaemic, a small blood transfusion or plasma transfusion may correct the serum protein level.

The various fluids that have been used for parenteral therapy are Hartmann's solutions, Darrow's, Ringer's and Bulter's Formulas In some clinics these solutions are not used and instead, half normal saline or 10% glucose in distilled water is given to correct the electrolyte imbalance. Thus the post-operative care in these infants and children will depend upon the patient's condition, the blood chemistry, the clinical observation of the patient, and the course of the disease. Even the most critically ill patient can be pulled through if appropriate laboratory tests are done, and frequent clinical observations are made for guiding the replacement therapy, which may dictate the success or failure in the post-operative period.

CHAPTER 35

GERIATRIC SURGERY

Surgery in the aged has been greatly simplified by the methods adopted in the preparation and management after operation in these cases. Even with recent advances in medicine and surgery, the mortality rate following operations on patients more than about 60 years of age is about 9%. These patients usually are poor surgical risks and a careful examination is necessary to find out if they are suffering from chronic nephritis, cardiac disease, arterio sclerosis, respiratory tract disease and urinary tract disease. Diagnosis of a surgical condition in the aged is difficult for several reasons. In the first place, the patient's attitude towards disease presents a problem. Some patients say: "Why did this have to happen to me?" "No one cares if I die, just leave me alone." "I am too old anyhow." These patients feel they know more than the surgeon and are prone to treat themselves in the early stages of the disease. Examination of these patients may be difficult because of obesity, arthritis, etc. The patient may have more than one lesion present and it may be difficult to tell which is causing the symptom of which the patient complains.

Medical consultations should be availed of for all patients past 60 years, who are to have a major operation. During the pre-operative treatment, a complete examination of the heart, liver and kidneys should be done. Hypoproteinaemia and Avitaminosis should also be corrected. The general nutrition of these patients is usually below normal and nutritional deficiency should be corrected before any operation is done. Electrolyte imbalance should always be suspected because these aged patients may have inefficient kidneys which may result in a slight state of chronic dehydration. Thus a pre-operative correction of nutritional, chemical and blood volume defects is extremely important in warding off post-

operative difficulties. Fluid imbalance must be corrected cautiously to avoid over-loading. The blood chemistry should be restored to normal, as in these cases, after serious illness, the patients may have a sodium and potassium deficiency.

The management of fluid and electrolyte needs in elderly patients is governed by the same principles that apply to the younger adults with a few modifications which are dictated by the altered physiologic status due to old age. Gamble has shown that a daily intake of 100 grams of glucose is necessary after operation. On the day of surgery, about 1500 c.c. of water is necessary to meet the fluid loss. On the second and third day, a maximum of 2000 to 2500 c.c. may be given in 24 hours. In patients who are maintained by parenteral feeding, 500 c.c. of a 0·9% saline solution containing 4·5 grams of sodium chloride should be given daily. After the second post-operative day, the patient may have hypokalaemic alkalosis. This syndrome is responsible for producing weakness, apathy, fever, paralytic ileus and a low urinary output.

If potassium is given to all surgical patients from 2nd or 3rd post-operative day the above syndrome is not likely to occur.

An early return to oral feedings following operations is the best protection against many of the post-operative complications due to electrolyte disturbance.

Plenty of Vitamins must be given, especially Vitamin C. If the patient is having protein deficiency, he is given Protein Hydrolysate orally or in some cases intravenously. Many of these patients are also anaemic and a couple of transfusions may raise his Haemoglobin percentage to a safe operative level before doing any radical surgery. Thus, after correcting the nutritional state of the patient, careful watch must be made not to overlook diabetes which is often latent in the aged. Another important problem that faces the surgeon is whether the patient has any pulmonary disease, acute or chronic. No elective operation can be done on patients who are having infections in the respiratory tract. Thus, after

correcting the nutritional state of the patient and after checking on the heart, lungs and kidneys, the patient is submitted to operation One of the most important functions of the surgeon is to prepare the patient's mind and see that he has an optimistic attitude towards his disease, and its treatment by operation. This will help the patient to have a smooth post-operative convalescence.

A proper anaesthetic must be selected for each case. Local and regional anaesthesia is satisfactory for the smaller type of operations. Spinal anaesthesia is not recommended, as it usually produces a fall of blood pressure. Gas and oxygen is suitable, if the patient is to be anaesthetised for a short time. Some of the lighter anaesthetics with Curare are popular in the case of abdominal surgery in the aged. Morphia and other drugs for premedication should be used in smaller doses for these patients One must also remember that these aged patients are more susceptible to adverse influences such as blood loss, trauma, anoxia and anaesthetic overdosage. The choice of operation should be after careful examination of the patient and finding out the number of years of comfortable life that could be reasonably expected for the patient if all goes well. A good rule to follow is to carry out the less dangerous of the two procedures when there is a choice of more than one procedure for improving the patient's condition. At times, it may be necessary to do only palliative operation; but we must be keeping in mind the first law of medicine. "At least do no harm." Emergency operations in elderly group of patients is more hazardous than the elective operations since most of the post-operative deaths are caused by cardiac and pulmonary complications.

Post-operative Management:

Aged patients are likely to develop pulmonay complications. Secretions in the tracheo-bronchial tree must be removed by suction before the patient leaves the operating room. Hypnotics and analgesics should be used sparingly. Fluid and electrolyte balance must be carefully regulated and the rate of flow should not be greater than 50 drops per

minute. If it is allowed to flow in fast, a right heart failure and pulmonary oedema are likely to develop. The fluid replacement should be made at a slow rate because it is so easy to overload the circulation. It is wise to keep the elderly post-operative patient a little on the dry side but not too dry. Aminoacids and Protein Hydrolysate should also be given to maintain nitrogen balance.

In patients who cannot eat, Vitamins should be given parenterally in the post-operative period. The blood chemistry should be carefully checked and any potassium or chloride deficit must be corrected. The genito-urinary system and the bowels also require special attention in these old patients. After operation, early ambulation is preferred in these cases to prevent any complications like thrombosis of veins and thrombo-phlebitis. In some cases, a routine ligation of both superficial femoral veins are done to prevent this complication If thrombosis occurs, the surgeon may have to give Heparin and Tromexan and at the same time, have a check on the prothrombin time.

They are likely to get pressure sore and the nurse in attendance should see that the patient changes his position frequently. Lung complications are quite common and the patient must be made to cough in the post-operative period and breathing exercises must be started to prevent post-operative atelectasis. Prophylactic chemotherapy or antibiotics like Penicillin and Streptomycin are given parenterally for these patients. The cardiac condition of these patients must be carefully watched and a consultation with a cardiologist may be of great help. Lastly, these elderly patients must be protected from the emotional upsets in the post-operative period. The surgeon must always present an optimistic outlook. These patients are suspicious that the surgeons are not telling the truth, and they become despondent easily; hence the patient must be made to feel that everyone is interested in him and wants him to get well He must also be made to get out of bed to prevent some of the post-operative complications and to make him feel that he is all right.

Care of elderly patients with cardiac disease is on the following lines:

1. Complete examination with X-ray film of the chest.
2. Blood pressure determination.
3. E. C. G.
4. Vital capacity.
5. Bleeding time and coagulation time are all done in these cases. A consultation with a cardialogist may be of great help.

If the patient is having a congestive heart failure, he must be digitalised pre-operatively and kept on a 400 mgms. sodium diet. Mercurial diuretics are utilised in an effort to establish an oedema free patient. A minimum of 5 to 7 days is spent in the hospital for pre-operative preparation.

Thus when there is cardiac decompensation or coronary disease, this must be treated first before any elective operation is done.

The anaesthetist must carefully select the suitable anaesthetic for these cases. Local anaesthesia is probably the safest. Pre-operative antibiotic treatment is instituted and continued in the immediate post-operative period. All patients are urged to avoid smoking in an effort to keep the tracheo-bronchial secretions at a minimum.

Post-operative care:

Prevention of anoxaemia is of prime importance. Fluid administration by the intravenous route should be avoided if the patient has cardiac failure. The house surgeon should watch the patient very carefully for any complications like:

1. Cardiac failure — treated by giving plenty of oxygen, morphia and atropine.

2. Cardiovascular accidents like haemorrhage, thrombosis or embolism.

3. Carotid sinus syndrome which can be controlled by atropine.

4. Anginal attacks which can be treated by morphia injection subcutaneously or nitroglycerine 0·3 mgm. sublingually.

5. Auricular fibrillation treated by Quinidine and when auricular flutter occurs, patient may be put on digitoxin.

To prevent these cardiac complications, the anaesthetist must see:

(a) that the blood pressure is maintained at a normal level during the operation;

(b) that the patient has plenty of oxygen;

(c) that the blood loss is corrected immediately.

The house surgeon must see that the patient has:

1. no cardiac embarrassment in the post-operative period;
2. no abdominal distension or paralytic ileus;
3. saline or blood transfusion given within limits;
4. no sudden fall of blood pressure;
5. no urinary obstruction.

Conclusion:

The surgeon should not withhold surgical relief when it is indicated. The old quotation: "The old have as much right to live in comfort as the young" must always be remembered. These aged patients stand operations remarkably well if the operation is done gently, the anaesthetic is not too deep, sedatives are to the barest minimum, fluid balance is maintained properly and early ambulation is practised. It is this group which presents a problem to the modern surgeon in the way of surgical decision and when they become well, become our most grateful patients.

CHAPTER 36

SURGICAL CARE OF DIABETIC PATIENTS

The management of diabetes in a surgical patient requires the closest co-operation between the surgeon and the physician. The surgical condition must be treated by the surgeon and the metabolic problem should be tackled by the physician. Operative procedures can be carried out on these patients with safety when the diabetes has been well controlled by diet and insulin. These patients must be prepared before any elective surgery can be done: —

1. A complete Urine examination;
2. Blood examination including serum proteins;
3. A Glucose tolerance test;
4. An E. C. G.;
5. X-ray of the chest.

Before operation, the patient must have a complete examination of his heart and kidneys. Dehydration and electrolyte deficiencies must also be corrected. The Hb percentage must be brought to the normal level and any Vitamin deficiency must be corrected. Patients must be given insulin to correct the diabetes. If he has any infection, the patient must be put on antibiotics and the amount of insulin necessary may have to be increased to control the diabetes. If the patient is having coma, it is not advisable to operate on him. In some conditions, the removal of a septic part may make the patient recover from coma, but it is always better to operate on him after he recovers from coma. Examination of urine may have to be done every 4 hours to measure the amount of diacetic acid. Thus in these patients, the operation should be postponed, if possible, until the diabetic condition has been controlled. When the diabetes has been well controlled by diet and insulin, the surgeon could operate on him as if he were a non-diabetic. The dia-

betic patient may suffer from severe shock and if he is not properly prepared, he may pass into a stage of acidosis.

In desperate emergencies, operation is done first and the diabetes is controlled later. In all other cases, as the acidosis decreases and the diabetes gets controlled, the operability increases. The degree of acidosis is of course measured by the amount of diacetic acid in the urine.

Patients with diabetic acidosis must be differentiated from an acute abdominal catastrophe. In diabetic acidosis, the sequence of symptoms are: nausea, vomiting and pain; whereas in any of the abdominal emergencies, pain comes first and lastly vomiting.

The preparation of these patients before operation is as follows The patient should not be starved before operation as this will reduce the amount of glycogen in the liver. These patients can have the usual breakfast 4 or 5 hours before the operation and the daily dose of insulin. In some patients, a small amount of carbohydrate and half the dose of insulin is given 4 hours before the operation Intravenous glucose may be used in those cases where an empty stomach is desired by the surgeon. Insulin should not be administered immediately before an operation as the patient may pass into a state of hypoglycaemia while he is unconscious. Morphia is generally avoided in the diabetic patient because the surgeon may find it difficult to know whether the patient is drowsy from the effects of anaesthesia or morphia

Anaesthesia: The anaesthetic that is used for these cases are gas and oxygen, local or spinal Ether is not used due to its depressing effects upon the liver, and because of its raising the blood sugar. Nausea and vomiting also increases after ether anaesthesia and the patient may pass into a state of ketosis.

Post-operative treatment:

After an operation, these patients should be carefully watched to note the degree of unconsciousness. The urine

should be examined for sugar and diacetic acid every 2 hours. The amount of insulin necessary must be adjusted according to the colour of the Benedicts reaction for sugar.

Plenty of fluids must be given to these patients, so that the patient has a urine output of about 1000-1500 c.c. daily. Intravenous glucose must be given only if it is necessary. Within the first few days, the diet of these patients must be gradually increased till he gets back to his regular diet. Sometimes, it takes about a week or 10 days. During this period, the carbohydrate intake must be carefully controlled. If the patient is not able to take anything by mouth, intravenous dextrose is given upto a total of 80 grams in 24 hours.

In the post-operative period, the patient is likely to get the following complications:—

1. **Post-operative acidosis:** In this condition, diacetic acid is present in the urine; larger doses of insulin are indicated and the urine examination should be done to find out the percentage of sugar. Knowledge of the blood sugar level will help to find out if the patient is in hyper-glycaemia or not.

2. **Hypoglycaemia coma:** Examination of the urine will show absence of sugar, especially if the insulin dosage is not carefully controlled and the patient not given enough glucose.

3. **Infection:** If this occurs in the post-operative period, it is always dangerous to the patient. Antibiotics and proper controlling of the diet with the necessary amount of insulin may help the patient to go through this crisis. If the patient becomes very ill, blood urea, blood sugar estimation and CO_2 combining power of blood must be done to assess the condition of the patient Thus in the post-operative period, a careful watch of the patient must be maintained by the nurse or house surgeon for:—

(i) Insulin shock:—symptoms like weakness, sweating, mental confusion and coma;

(ii) (a) urine output; (b) frequent urine examination for sugar and diacetic acid; and (c) blood sugar determination;

(iii) if the patient has developed any insulin shock, intravenous glucose 5% solution should be started immediately.

If blood sugar determinations are not available, the rule of McKitrick and Root may be useful:—The urine is tested with Benedicts reagent and insulin administered according to the colour change: 20 units if urine turns brick red; 15 units if urine turns orange; 10 units if urine turns yellow and 5 units, if the colour is green.

Conclusion:

(a) Diabetics admitted in coma should first be treated for coma before surgery.

(b) If it is a surgical emergency, operate first and control diabetes later.

(c) Avoid anaesthetic agents which will produce nausea and vomiting. If gas and oxygen anaesthesia is contraindicated, employ local anaesthesia.

(d) Fluid balance must be maintained; Vitamin deficiency corrected; amount of insulin given, together with the percentage of sugar in the urine, and the degree of acidosis are noted in a chart.

(e) Crystalline insulin should always be given to control the blood sugar and as soon as the patient takes semi-solid or normal diet, the patient can return to the old medical regimen.

(f) Finally, the success in the management of the diabetic patient will depend upon the close co-operation between the surgeon and the physician in the pre-operative and post-operative periods.

CHAPTER 37

SURGICAL INFECTIONS

Among the common infections admitted in surgical wards may be mentioned (1) Gas gangrene, (2) Tetanus, (3) Furuncles and boils, (4) Carbuncles, (5) Osteomyelitis, (6) Actinomycosis, (7) Erysipelas and (8) Chronic ulcer.

Gas gangrene is due to infection by anaerobic organisms like B. Welchi, B. Sporogenes, B. Oedemati, and B. Oedematiens maligni. Gas gangrene infection usually occurs as a result of contamination of extensive wounds with manured soil, faecal matter or dirty clothing or road dust.

The clinical features are:

(i) Oedema of the affected part,

(ii) Crepitus on palpating the affected part,

(iii) Serosanguineous exudate,

(iv) Skin over that area becoming brown or blackish,

(v) Patients are very toxic with rapid thready pulse and they go into a state of septicaemia and shock,

(vi) The blood pressure falls and the patient becomes cold and clammy due to selective action of the toxins on the suprarenal glands.

If the patient is seen after the infection has taken place, the condition becomes a surgical emergency and he must have massive doses of antitoxins. Knock out doses of antibiotics must be given, and surgery done as soon as the general condition improves Massive doses of sulphonamides were in vogue before the antibiotics came into existence. After the advent of antibiotics, the mortality and morbidity have been considerably reduced Penicillin in doses of 1 million units every 8 hours by the drip method has been used to control infection. Of late, intravenous Aureomycin or Terramycin is given to control the rapidly spreading infection. Multiple incisions over the involved area, and removal of infected muscles and tissues are done to limit the spread of

infection. In some cases of Gas gangrene of the limb, a guillotine amputation may be the only way to save life.

Gas gangrene infection of the abdominal wall has occurred after appendicectomy for gangrenous appendicitis. In such cases, the wound is reopened and irrigated with hydrogen peroxide. Massive doses of Penicillin and Anti-Gas-gangrene serum are also given for these patients. The wound is dusted with Penicillin and Sulphanilamide powder.

Conclusion:

(a) Penicillin, 1 million units, every 3 hours or Achromycin 2000 mgm. (2 gms.) intravenously in 24 hours.

(b) Polyvalent gas gangrene antitoxin, 20,000 units, I.M. at once and repeated every 6 to 8 hours.

(c) Adequate surgical debridement with multiple incisions and removal of all dead tissue.

(d) Shock treated by Blood Transfusion and correction of Fluid balance by intravenous fluids.

Cancrum oris

The next serious infection met with in surgical wards is Cancrum oris. This condition is defined as an Infective gangrenous stomatitis. It usually occurs in children between the ages of 2 and 5 and the infection spreads involving the gums, the jaw and the floor of the mouth. The tissues slough off and the patient presents a ghastly appearance due to loss of cheek, nose or upper lip. The upper jaw or lower jaw may be exposed after the tissues have sloughed. The general condition of these children are very poor and they are hypoproteinaemic, hypovitaminosed and anaemic, and about 50 to 60% of them die of lung complications.

The treatment consists in instituting:

1. proper oral hygiene;
2. removal of dead tissues by means of cautery;
3. Penicillin morning and evening, 2½ lakhs b.d.;
4. if the patient is anaemic, a small blood transfusion is given;

5. General health is improved by giving the patient nourishing diet and plenty of Vitamins;

6. The deformity should be treated by plastic surgery when the infection has completely subsided.

Tetanus is a serious surgical condition that occurs after an injury, due to Cl. Tetani Infection. Cl. Tetani is a slender gram positive organism. It produces a powerful Toxin which causes Tetanus. The incubation period varies from 18 hours to about 15 days, the average being about 11 days. Occasionally, the patient may get Tetanus some months after the injury. Sometimes it has been found to occur after removal of foreign body from the site of injury. It has also occurred after remanipulation in cases of compound fractures. A prophylactic injection of antitoxin considerably lengthens the incubation period.

Prevention: In every case of injury, however trivial it may be, Tetanus antitoxin, 3000 units, should be given immediately and thereafter at weekly intervals till the wound is healed. The dose of 3000 units is repeated if the patient is to be operated or if manipulation is being done for a compound fracture. This method of passive immunisation has lowered the mortality to a very great degree. The next method that is in vogue is active immunisation which is done by giving 2 injections of Tetanus toxoid in 1 c.c. doses at interval of 6 weeks between the injections.

Clinical features: The first sign in some cases may be inability to open the mouth, Trismus and Risus-Sardonicus. The muscles of the neck and back become stiff and the patient gets spasms at frequent intervals. Opisthotonus or Pleurosthotonus or Emprosthotonus may occur. Sweating is very profuse and the patient gets severe cyanosis if spasms of the diaphragmatic and intercostal muscles occur.

Various types of Tetanus that have been noted are:—

1. Cephalic Tetanus where the Tetanus is limited to the region of the head, and the muscles of the neck are chiefly affected,

2. Splanchnic Tetanus is the type where the abdominal muscles go into a state of spasm.

3. Generalised Tetanus with or without spasm may be present.

4. Local Tetanus where only a group of muscles in a limb is affected.

5. Post-operative Tetanus. The catgut used has been blamed or in some cases, inadequate sterilisation of the materials used for operation has been the cause.

6. Tetanus Neonatorum is an unfortunate complication due to infection getting through the umbilical cord. This occurs as a result of lack of proper care of the umbilical cord.

Tetanus has to be differentiated from other conditions like impacted wisdom tooth, carious tooth, fractures of the jaw, parotid infection and arthritis of the tempero-mandibular joints. When the neck muscles are rigid, it should be differentiated from meningitis. Another condition from which Tetanus has to be differentiated is Tetany where spasm of the hands and feet occur due to low blood calcium. Strychnine poisoning gives rise to symptoms which resemble very closely to those of tetanus. The only method of differentiating them is, that in strychnine poisoning there is muscular relaxation between the recurring paroxysms whereas in Tetanus, tonic spasm is continuous.

In Rabies reflex spasm of the muscles of deglutition and respiration occur especially when the patient attempts to drink. Even the sight of water may start the paroxysms.

Treatment : —

1. Absolute rest in bed.

2. Patient kept in a darkened room and no visitors allowed.

3 Patient is given antitoxin, 200,000 units intravenously or 100,000 intravenously and 100,000 units intramuscularly. Before giving the antitoxin, the patient's sensitivity should be tested. If the patient has a tendency to be allergic, desensiti-

sation is required in those cases. If symptoms of anaphylaxis appear, the patient must get an injection of Adrenalin ½ c.c. of a 1 in 1000 solution subcutaneously. After a week, a second dose of antitoxin, 50,000 units intravenously, has been advocated by Cole, this dose being repeated every week. Other clinicians advocate 100,000 units on alternate days after the patient has received the first large dose of 200,000 units.

Treatment of the wound: This is started after the antitoxin is given, as any treatment before may send some of the toxins from the wound into the systemic circulation.

All necrotic tissues and foreign bodies are removed from the wound and it is adequately drained. The wound is irrigated with Hydrogen Peroxide or Zinc Peroxide paste may be applied to the wound.

Diet: The patient should have at least 2500 calories a day; plenty of milk, eggs, orange juice and soup are given. The fluid balance must be checked and if the patient is not able to take anything by mouth, rectal and intravenous methods of supplying nourishment are started. In some cases, nasal feeding may be done but it is very difficult to pass the Ryle's Tube as the patient gets spasms of the muscles of the neck and those round the larynx.

Treatment of spasms: To control spasm, Curare or d-Tubocurarine Chloride may be useful. Curare is a double edge weapon and when it is being given, respiration should be watched as the patient may go into a state of cyanosis very quickly. The usual dose of Tubocurarine is 2·0 to 2·5 milligrams per stone of bodyweight, injected intravenously. The action of this lasts for about 30 to 45 minutes, and repeated doses are given if necessary. Sometimes, intramuscular injections of 7·5 milligrams every 2 hours may be given to afford considerable relief of symptoms. The endotracheal tube will have to be passed immediately and if it is not possible, an emergency tracheotomy must be done.

Sedatives to control the spasms are given, the usual drug being Paraldehyde given in doses of 3 to 6 c.c. intramuscularly

every 6 hours. In some cases, Avertin may be administered per rectum, and in such cases, the patient may have to be watched very carefully for cyanosis.

A chloral and bromide mixture can be given for these patients if they are able to swallow; otherwise Chloral Hydras is given per rectum.

When the patient gets respiratory complications or cyanosis, oxygen may have to be administered. A tracheotomy set should always be kept ready to be used in emergency, especially when the patient is getting Flaxedil or Curare for control of spasm. Mephenesin (Tolserol) 1-3 gms. orally or 1-2 gms. intravenously (2-5% solution) may be combined with barbiturates and given to the patient to control the muscular spasms. Davidson, Ward and Park in 1949 suggested the use of Myanesin intramuscularly in doses of 0 5—1·0 gram, four or more times daily, to control the spasms.

Nursing attention must be of a very high order and personal attention is absolutely essential to get over the crisis. Patient is usually constipated and an enema may have to be given daily. The urinary output must be watched and in some cases, catheterisation of the bladder may be necessary.

There are some "dont's" which should be remembered in the treatment of Tetanus :—

1. Don't give antitoxin intrathecally.

2. Don't do a lumbar puncture if the case has been diagnosed as one of Tetanus.

3. Don't give antitoxin without testing the patient for serum sensitivity.

4. Don't treat the wound without giving antitoxin before.

Carbuncle

Carbuncle is an inflammatory process and is defined as an infective gangrene of the subcutaneous tissues. The causa-

tive organism is staphylococcus aureus. Predisposing causes are :

1. Diabetes mellitus,
2. Chronic nephritis,
3. General ill-health and debility,
4. Fricton, e.g. by the collar or braces.

The usual sites are: (i) back of the neck; (ii) scapular region; (iii) sacral region.

Treatment: Conservative measures must be applied in the early stages. These include :

(a) short-wave diathermy;

(b) application of dry dressing and elastoplast strapping;

(c) treatment of diabetes mellitus, if it is associated with it;

(d) administration of Vitamins;

(e) parenteral Penicillin 5 lakhs, 3 times a day, or Aureomycin or Terramycin I.M. or I.V. is given to control the acute infection.

(f) local instillation of Penicillin all round the carbuncle beyond the indurated zone is given to prevent the spread of infection. About 1 lakh of Penicillin at 1 cm. distances is injected all round the carbuncle; a total dosage of about 5-10 million units may be given depending upon the size of the carbuncle.

This may be repeated every third day if the condition has not subsided. As the instillation is very painful, the patient may be anaesthetised by gas and oxygen.

Post-operative convalescence is very short and the wound heals in about 3 weeks time. If the central portion of the carbuncle has sloughed off, a small incision is made to let out the pus and remove all the slough. Sometimes, a crucial incision may be made and the flaps separated to remove all the sloughs. The latter method may leave a wound which may take some months to heal. With the advent of the antibiotics and the local instillation therapy, the stay of the patient in the hospital has been considerably shortened.

Erysipelas

This is a diffuse infection of the lymphatics of the skin by streptococci, the characteristic signs being:

1. The skin over the area being red and shiny with a raised edge.
2. A feeling of discomfort over the area.
3. Edge of the area is markedly irregular in outline.
4. If the condition occurs over areas which contain lax subcutaneous connective tissue, for example, eyelids or scrotum, there is considerable oedema and cellulitis of the underlying tissues. Patient is toxic with high rise of temperature and Cardiac failure may occur. If the infection has occurred over the face or mouth, the oedema may spread down to the glottis and an immediate tracheotomy may be necessary to relieve the respiratory distress.

Treatment:

Patient is confined to bed: Nourishing diet, chemotherapy and antibiotics are given to control the streptococcal infection Local treatment consists in application of hypertonic saline or lead lotion over the area. Sometimes, Glycerine Mag. Sulph. compresses are applied to reduce the oedema. The infection may be completely aborted, if treatment is done early; otherwise, the patient may develop abscesses in the courses of the lymphatics or in the glands above the lesion. If the infection is very virulent, patient may die of septicaemia.

A **boil or furuncle** is a localised infection of the skin due to staphylococcal invasion of the hair follicle or sebaceous gland leading to suppuration and local gangrene.

Treatment: Many boils may be oborted by the use of Penicillin. If pus has formed, a small incision is made to let it out. The wound is dressed with vaseline gauze and parenteral Penicillin therapy is continued.

Osteomyelitis: Acute osteomyelitis usually occurs as a result of acute pyogenic infection of the bone by staphylococ-

cus aureus and occasionally by staphylococcus albus. Patient has a swinging temperature, rigor and a rapid pulse. Pain and tenderness in the limb are the only signs over the site of infection.

A blood count usually shows a leucocytosis of 20,000—25,000/per c.mm. X-ray of the bone at this stage may not be of much value. The neighbouring joint may be swollen and sympathetic effusion may be present.

Treatment:

(1) Penicillin therapy in the early stages;

(2) The limb is splinted.

(3) If the condition is not resolving and toxaemia is not subsiding, incision of the periosteum and drill holes are made over the bone to let out the infection from the medullary cavity. The only surgical aim in acute osteomyelitis is to provide free drainage for the abscess inside the bone. The wound is then packed with vaseline gauze, and the limb splinted by plaster of Paris. The dressings should not be touched if the temperature and pulse are normal. If there are any complications, the plaster should be removed, and the wound explored. When the acute infection has subsided, there will be sinuses discharging pus as a result of small pieces of sequestra separating. The separation of the sequestra takes 2 to 3 months and in some cases, even longer. As soon as the separation of sequestrum has occurred, as seen by the X-ray, the wound is opened and sequestrectomy done. After the operation the wound is packed with Penicillin, Sulphanilamide powder and vaseline gauze is applied and the limb immobilised in plaster. Parenteral Penicillin therapy should be continued and the part kept at rest in Plaster till it completely heals.

In the post-operative period, the patient may be complaining of very bad smell or severe itching due to the dressings being sodden with pus. If the plaster has been soaked with discharge, it can be removed and a fresh plaster applied. For very bad odour which most patients complain of, some

deodorant bags or scents may be placed near it to overcome it.

Actinomycosis: One of the chronic infections met with in the surgical wards is actinomycosis. This disease is due to infection with Streptothrix Actinomycosis. The part affected becomes swollen and suppuration occurs and pus comes out through small sinuses all over the area. The discharged pus is characteristic, consisting of thin seropus among which can be detected sulphur-coloured granules which, on examination, are seen to be masses of mycelium. The spread of the disease occurs by direct extension to the neighbouring tissues. Sometimes, blood stream infection can also occur. The usual sites for actinomycotic infection to occur are: (1) Jaw; (2) Mouth; (3) Neck; (4) Lungs; (5) Intestinal tract.

The diagnosis can be made by finding the granules or mycelium in the pus.

Treatment:

1. Antibiotics like Penicillin, Streptomycin or Aureomycin should be given.
2. If the infection is resistant to antibiotic treatment, deep X-ray therapy may be given. In some cases, large doses of Potassium Iodide ½—1 drachm three times a day have been given but without any convincing evidence of success.

In cases where the disease affects the ileocaecal region, surgical treatment may be advocated. The general health of these patients must be improved and the patient must have a nourishing diet with plenty of Vitamins.

Mycetoma or Madura foot occurs as a result of a Streptothrix infection entering through abrasions on the feet. Clinically the foot becomes swollen and painful, and X-ray picture of the foot reveals an area of caries, involving the metatarsal or tarsal bones. Later, numerous sinuses appear discharging pus which contains yellow granules.

Treatment: Penicillin therapy or Streptomycin or Aureomycin should be given. In some cases, the sinuses

should be curetted, but if the foot has been completely disorganised, amputation just above the diseased area is the best form of treatment. Radium therapy and iodides are of no use in these cases.

Tuberculosis

Many patients come to the surgical out-patient department with tuberculosis of the glands, lungs, gastro-intestinal or genito-urinary tract. One of the principal problems in the diagnosis of tuberculosis is the finding of early cases before symptoms are present. The characteristic symptoms like cough, weight loss, evening rise of temperature and night sweats when they appear cannot be considered as early *manifestations of tuberculosis. Periodic X-ray examination of* the chest is the only way to discover the early cases. Any suspicious spot on the lung should be considered as tuberculous until it is proved otherwise. Discovery of tubercle bacilli or a positive skin test should be considered as a positive proof of the infection. The presence of tubercle bacilli in the sputum, weight loss, night sweats, evening rise of temperature, pleurisy with or without effusion and increased blood sedimentation rate are definite signs of activity of the tuberculous lesion.

Treatment:

1. Rest either at home or in a sanatorium;
2. Diet — high protein, high vitamin and a high caloric diet.
3. Surgery in the form of thorocoplasty or pulmonary resection depending upon the condition. Pulmonary resection has gained increasing popularity in the treatment of pulmonary tuberculosis in the past few years.

The treatment of tuberculosis has been completely revolutionised after the advent of drugs like Dihydrostreptomycin, Paraminosalicylic acid and Isonicotinic acid hydrazide For patients with tuberculous lumph glands, excellent results have been reported after the use of Streptomycin, PAS and Isonicotinic acid hydrazide. If the gland has become

caseous, aspiration of the pus followed by local instillation of PAS has been found to be very useful. Patients who have sinuses discharging seropurulent pus should also be treated by Streptomycin, PAS and INH. In genito-urinary tuberculosis, the results have been very encouraging following treatment with Streptomycin. In cases of abdominal tuberculosis, Streptomycin therapy has definitely altered the prognosis for good.

For tuberculosis of joints and bones, a combination therapy using Streptomycin, PAS and Isonex has given very encouraging results. After prolonged administration of Streptomycin, a few patients may develop drug rashes, drug fever, deafness and vertigo. Vestibular damage, may occur following high or prolonged dosage. If Streptomycin is discontinued immediately, recovery usually follows. The use of combined Streptomycin and Dihydrostreptomycin in equal parts reduces the incidence of deafness.

Chronic ulcer

This condition usually occurs as a result of:

1. Lack of rest and of proper treatment to the injured part.

2. Venous stasis and defective circulation in the legs;

3. Venous obstruction as in cases of varicose veins or femoral thrombosis.

4. Constitutional diseases like diabetes and anaemia.

The treatment of this condition would be:

(a) If all acute ulcers are properly handled by removing the cause and giving complete rest to the part, chronic ulcers may become a rarity.

(b) Pressure sores which occur after the application of splints or plaster bandages may become chronic, and prevention of this consists in careful nursing and protection, or padding of the bony areas with cotton.

(c) Bed sores are also a variety of chronic ulcers which can be avoided in all except in the paralysed patient, and

when it occurs, it is a serious reflection on the care taken by both the doctor and nurse. The skin of the patient must be washed with soap and water and gently rubbed with a stimulating lotion. Later, spirits or Eau de Cologne may be applied to harden the skin. If the patient is paralysed, then a water bed or an air bed must be provided and the nurse should see that there are no creases in the bed sheets.

(d) When the patient has come in with a chronic ulcer, the local treatment consists in removing all the slough and debris, and Eusol dressing is applied for the first few days. When the wound is clean, lotio rubra is applied to stimulate granulation tissue formation. Later scarlet red ointment is applied for quick epithelization to occur. In some cases, short wave therapy or infra-red radiation has been found to be useful. If the ulcer occurs over the feet or legs, immobilisation in Plaster of Paris after dusting it with Penicillin or Sulphonilamide powder is done. Chemotherapy and immobilisation has been found to be very useful in these chronic lesions.

(e) If the ulcer shows signs of malignancy, a biopsy should be done to confirm it, and radical measures must be applied. If a malignant ulcer is over the leg or foot, amputation has to be done.

When the chronic ulcer has not responded to any treatment, excision should be considered and a pedicle graft applied to prevent any deformity.

CHAPTER 38

BURNS AND SCALDS

A burn results from destruction of the surface layers of the body, and sometimes of the deeper tissues due to direct contact with an object radiating heat. Thus, burns may be due to the following causes:—

1. A flame coming in contact with the surface of the body;
2. Steam — when due to this cause, the lesion is called a scald;
3. Inflammable liquids like petrol and oil;
4. Electric current, incendiaries, explosives and various types of bombs;
5. Radium emanations and X-rays.
6. Burns may also occur as a result of chemical caustics.

Classification: Burns are classified according to their extent and depth. There are two classifications that are commonly used. The older classification according to Dupuytren is as follows:—

1. First degree where there is a simple erythema and the patient has pain, redness and warmth of the part affected.
2. Second degree is characterised by vesication and the patient has numerous blisters. This degree of burns is very painful due to the nerve endings being exposed. Infection is likely to take place in this type, and healing may be delayed, but usually, healing occurs without scarring when there is no infection.
3. Third degree where the papillary layers of the skin are affected and the pain is very severe because the nerve endings are all exposed, and scarring invariably results when healing takes place.
4. Fourth degree where the whole skin has been burnt, the skin glands are also destroyed, and scarring is extensive with deformities and keloid formation.

5. Fifth degree where the muscles have been involved.

6. In the sixth degree, there is complete charring of the part and all the structures are burnt.

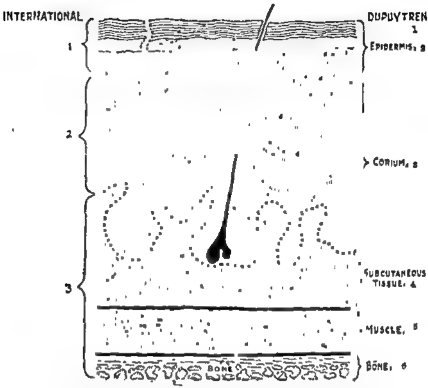


FIG. 65. Diagram showing Dupuytren's classification of burns.

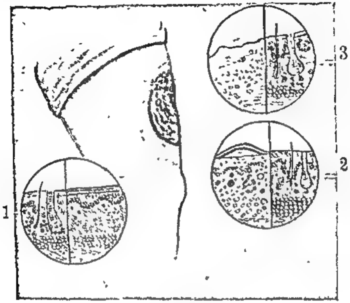
Thus, when a patient gets a burn, various parts of it may show different degrees of burns. In some places, it may be the first and, in others, it may be in varying degrees.

The next classification that has come into prominence during World War II and can be rightly called as War Surgery classification is as follows:—

(1) Superficial; and (2) Deep.

The superficial variety includes the first 3 degrees of Dupuytren and the deep, the rest By superficial burn is implied, involvement but not destruction of skin; deep implies

that at some point in the burnt area, there has been loss of the whole thickness of skin.



1 First degree 2. Second degree 3. Third degree.

FIG 66 The modern classification of Burns. Types and degrees of burns

Various tables have been devised to help in estimating the extent of burns. Berkow estimated the extent of surface lesion as follows:—

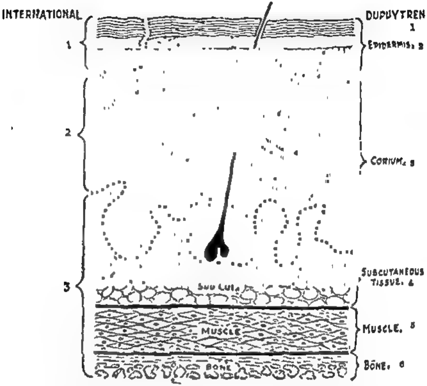
TABLE I

Area:		
Palm of hand	..	1 %
Both hands	..	4·5 %
Both arms and forearms	..	13·5 %
Both upper extremities	..	18 %
Head	..	6 %
Trunk, anterior surface	..	20 %
posterior surface	..	18 %
Both feet	..	6·33%
Both legs	..	13·66%
Both thighs	..	19 %
Both lower extremities	..	38 %

As a ready method of calculation in an emergency, what is known as a rule of nine is applied. In this method, the

5. Fifth degree where the muscles have been involved.

6. In the sixth degree, there is complete charring of the part and all the structures are burnt.



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etiology of toxaemia in burns is still obscure and various hypotheses have been suggested.

In the third phase, infection may take place and it usually occurs after the fifth day. The patient may then pass into a state of septicaemia, if the infection is not controlled.

In favourable cases, the last phase is that of healing. This depends upon the extent and depth of the burns and the treatment adopted.

First Aid treatment: If the patient's clothes are in flames, he is wrapped in a blanket and rolled on the floor. He is then put to bed and hot sweet drinks are supplied. The clothing is not removed or further dressing applied until he is transported to the hospital. The best emergency dressing *is to use a bland evaporating dressing, e.g.,* baking soda paste (baking soda is mixed with sufficient water and made into a thin paste and spread over the burnt area). Firm bandage is applied to prevent any loss of fluid.

Patients with over 5% of the surface area burnt or with burns of the face should be sent to the hospital. If it is more than 10%, they must be rushed to the hospital within an hour.

Pain can be relieved only by morphia, and the amount given, and the time of administration should be clearly recorded in every case.

Treatment in the hospital: General treatment of the patient has the first priority and the wounds are left untreated until the condition has improved sufficiently for local treatment to be carried out.

Pain: Adequate amount of morphia is given to relieve it and if a quick result is desired, 1/6th gr. is given intravenously. A card should be affixed to the patient's case sheet, noting the time and the amount of morphia given to prevent any over-dosage.

Replacement therapy: Plasma loss is very severe in cases of burns and this depends upon the extent of the burns.

extent of involvement is determined in multiples of nine as shown in the following table:—

TABLE II

The head and each of the upper extremities are 9% of total body surface.

The front of the trunk, the back of the trunk and each of the lower extremities are 18%.

From an accurate estimation of the extent and nature of the burnt area, the fluid requirements to combat the shock can be worked out.

If more than one-third of the body surface is burnt, the condition of the patient is described as serious. When 50% of the body surface is burnt, even with modern methods of treatment, recovery is rare. When 75% of body surface is burnt, it is invariably fatal.

Infants and young children succumb very quickly to burns, even though the extent of the burns may not be more than one-third of the body surface The clinical course of a patient suffering from burns passes through four phases. In the first phase, the patient is in a state of shock and in this period, the volume of fluid in the circulation is diminished due to the loss of plasma. Owing to the dimunition in the circulating volume, the vicious circle of shock starts and, if it is not broken, the patient rapidly goes downhill. The blood pressure falls and examination of the blood reveals a haemoconcentration Thus shock starts immediately after the burn and is usually due to the stimulation of the sensory nerves exposed in the burnt area, and to the loss of fluids from the circulation. As a result of the loss of fluids, the blood volume gets depleted and the patient loses proteins and electrolytes from the body.

The second phase is the development of toxaemia. It usually starts 48 hours after the injury. In this phase, the patient's temperature rises; there is restlessness and tachycardia, and finally, he may pass into a state of delirium and coma The blood urea rises and jaundice may develop. The

and promptly restore the kidney function, by adequate restoration of the circulating blood volume.

Fluid balance charts are kept and the amount of urine is watched carefully. The pulse rate and blood pressure should be recorded every half hour. The pulse rate and the blood pressure returning to normal are good indications of a satisfactory response to fluid replacement therapy.

As a result of the fluid loss, the patient becomes hypoproteinaemic. A high protein diet is therefore instituted as soon as he is able to ingest it. This must also contain all the essential amino-acids.

After the first 48 hours, the fluid and electrolyte requirements of a case of burns are much the same as of any other surgical patient. Salt loss in the burnt area may continue and therefore about 10 gms. of sodium chloride should be given everyday.

Nutrition of the patient: As a result of extensive burns hypochromic anaemia sets in soon and infection takes place and retards quick wound healing. Nutritional therapy therefore must be instituted, and the diet for an adult patient should be about 3000 to 4000 calories per day. If oral intake is not adequate, the diet may be supplemented by a drip feeding. Plenty of proteins and amino-acids are given for these patients. Vitamins also should be given as the patients get into a state of hypovitaminosis, due to extensive burns and deficient intake. In many of these cases of burns, there is loss of urinary nitrogen which may rise upto about 50 gms. in 24 hours. If the patient is not supplied with enough proteins, he will very soon suffer from nitrogen deficiency and the patient utilises his own body proteins to supply the need. The blood protein therefore drops down to 2 or 3 gm. % and even intravenous plasma may not bring it to the normal level. As a result of this hypoproteinaemia, the patient may develop extensive oedema all over the body. The exact amount of Vitamin requirement for a case of burns has not yet been determined, and hence it is better to give larger doses in these cases.

A pulse, respiration and blood pressure chart is maintained in every case. Haemoglobin percentage or haematocrit reading should be determined three or four times a day during the first few days. The amount of fluid to be given to a patient can be determined by Harkins method. For every 1 point rise in the Haematocrit reading above the normal of 45, 100 c.c. of plasma is given intravenously.

Another method of calculating the amount of plasma that should be given to a case of burns is based upon the following formula of Black:—

$$\text{Plasma loss in litre} = \frac{5 \times Hb_1}{Hb_2},$$

where Hb_1 represents the Haemoglobin in normal individual which is 100%.

Hb_2 represents the percentage of Haemoglobin in the patient after burns. There will be an increase in Haemoglobin percentage due to Haemoconcentration.

If the condition is very serious, plasma is started at once and later on, whole blood transfusion It is true that there is haemoconcentration in cases of burns but because of the destruction of R.B.C's in severe burns, at least half the transfusion should be whole blood. In these cases of severe burns, large amounts of extracellular fluid are also lost and the patient should receive in addition water and sodium in the form of saline or 1/6th Molar Sodium Lactate parenterally. A rough calculation that has been devised for a superficial burn and a deep burn is as follows;

The proportion should be:

For a superficial burn: Plasma 1 and saline 1.

For a deep burn: Blood 2, plasma 1 and saline 1.

A functioning kidney is the best regulator of blood chemistry and this can be brought about by giving him fluids to combat the shock and raise the glomerular pressure. Thus the aim of fluid therapy in burns is to correct the shock

these dressings which causes severe pain on changing. This line of treatment has also gone out of vogue.

As far as the wet dressing method is concerned, vaseline gauze dressings or Tullegras or Sulphonamide Tulle have been used. During the last War, all combinations have been tested and, at present, surgeons are using Penicillin Tulle and Aureomycin Tulle dressings for these cases. Sulphonamide ointment was very popular at the commencement of the Second World War. 3% Sulphodiazine ointment, 3% Sulphanilamide with 8% Triethonalamine and 5% Sulphathiazole ointments have been used from time to time. The results have been extremely variable. The one important danger when Sulphonamides are applied to an extensive burn is, that the amount of absorption of this drug may be very high, and the patient is likely to get Sulphonamide toxicity. Some of them have developed Sulphonamide anuria. Hence the blood level concentration of Sulphonamide has to be determined whenever this method is adopted for extensive burns

The next method of treatment for burns is to use saline baths. If the limb has been involved, this is surrounded by an envelope known as Bunyan Standard envelope, whereby the limb is irrigated within this envelope by saline. This method has been helpful especially for burns of the hands so that the patient can exercise his fingers and thus prevent stiffness and contractures.

Another method that has come into vogue of late is to use thick split skin graft. These are maintained by pressure dressings and gives the best cosmetic result. In some cases it may be possible to obtain enough skin from the patient to cover the large surface that has been burnt. After the grafts have taken, saline gauze dressing is removed and vaseline or cod liver oil dressings or penicillin dressings are applied.

The complications that are likely to follow after burns are :—

1. *Infection*. This can be combated by Penicillin, Sulphonamide or Aureomycin. When the coagulative method of

Pain: After extensive burns, the patient may have severe pain which can be combated only by morphia. This may have to be repeated every 6 or 8 hours.

Local Treatment for Burns

There are two schools of thought in the management of burns: (1) Coagulative dressing for burns; (2) wet dressing for burns. Coagulative dressings are (i) Tannic Acid line of treatment; (ii) Silver Nitrate; (iii) Triple dye treatment.

5% Tannic Acid alone or 5% Tannic Acid followed by 10% of Silver Nitrate has been used in cases of burns. It has been found that this line of treatment reduces the rate of healing, and is a definite menace, especially if the burnt area involves the whole limb or a finger. The thick scab that forms round the limb or finger after the Tannic Acid treatment constricts the part and prevents effective venous drainage, and the patient is likely to get gangrene or necrosis of the digits. This line of treatment also produces central necrosis of liver and hence it has been discarded by most surgeons.

The next method of treatment is the Triple dye treatment which consists of Gentian violet, brilliant green and acriflavine. This solution is sprayed over the burnt area until a scab forms. The rationale for the triple dye treatment lies in its ability to combat infection and to form a protective eschar. If any infection occurs and pus forms underneath the crust, it very soon comes out, as the crust becomes softened over those places. The result after this line of treatment has been fairly satisfactory.

Another method of dressing that was in vogue during the last War is the pressure dressing of Koch. The aim of this dressing is to prevent any loss of fluid from the burnt area. These dressings are changed every 7 days. If the burnt area is on the chest or abdomen, the pressure dressing cannot be applied satisfactorily because it interferes with the respiratory movement. Infection also occurs underneath

Burns of the face and scalp: When the scalp is involved the hair is shaved and it is treated with sulphonamide or penicillin ointments or tullegras dressings applied. If it is a deep burn the sloughs are allowed to separate and when the wound is granulating skin grafts are applied.

Burns of the hand: The hand is cleansed with 1% Cetavlon and the fingers are covered after application of penicillin or aureomycin ointment with a vaseline bandage. After the bandage the patient must be instructed to exercise his fingers. In cases of deep burns of the hand the raw areas must be covered with skin grafts as soon as possible to avoid contractures.

Burns of the air passages: This is likely to occur due to inhalation of steam. The patient may get oedema of the vocal cords and an emergency tracheotomy has to be performed if laryngeal obstruction develops. Oxygen is given through a B.L.B. mask and penicillin should be given parenterally to prevent lung complications.

Chemical burns: This may be due to acids or alkalis. If it is due to caustic soda the burnt area is irrigated with a 5% solution of ammonium chloride, which should be done within a few minutes after he gets the burn. Later the usual dressings using either penicillin or sulphonamide ointment may be applied. In case of nitric acid burns Eusol solution has been used for irrigation by Roberts (1941). If the burns are due to lime the part is washed with water or weak acetic acid and dressed with sulphonamide or penicillin ointment.

In general, the healing of burn can be stimulated by giving the patient blood transfusions, protein infusions, and a high protein and salt diet. During the stage of healing the joints in the neighbourhood of the burn should be exercised to prevent any contractures. Scar formation and oedema of the part can be minimised by gentle massage or wax bath or by applying lanoline each night. Keloid formation is an important complication and this has been treated by superficial X-Ray therapy in the early stages.

dressing is used, the triple dye method or the application of 1% Gentian violet is the best.

2. *Anaemia.* This can be combated by blood transfusion. Healing of the burnt area will be very slow and poor, if the anaemia is not corrected by repeated transfusions.

3 *Renal failure.* This is likely to occur especially after a burn, as the patient develops a haemoconcentration. The viscocity of the blood is greatly increased and the blood flow through the kidney is slow. Anuria therefore sets in. Treatment for this is to check haemoconcentration by giving fluids.

4. Respiratory complications are Tracheitis, Bronchitis, Pneumonia or Broncho-pneumonia due to inhalation of steam or super-heated air. The patient becomes cyanosed and in some cases, oedema of the glottis occurs. When super-heated air is inhaled, the red cells that enter the alveoli of the lungs get injured and they break down giving rise to haemoglobinuria When this complication occurs, it usually indicates a fatal termination.

5. Some of the other complications that have been noted after burns are duodenal ulceration, fibrous contractures and keloids. The last two complications are likely to occur when the patient has a 3rd or 4th degree burn. Every effort must be made to prevent them as they are the most difficult complications to treat by the plastic surgeon.

Special Burns

Burns of the eye: If only the eye lid is involved vaseline or penicillin cream or cold cream is applied. If the burn has involved the conjunctiva the patient gets severe conjunctivitis, and if the cornea is involved ulcerations might occur. Treatment for such conditions consists in irrigation of conjunctival sac with normal saline, and instillation of a few drops of cocaine hydrochloride. In some cases penicillin or aureomycin ophthalmic ointment is used If the eye has been burnt by acids or alkalis, then the eye should be washed with saline and 1% atropine solution is instilled twice daily and liquid paraffin is put into the conjunctival sac every four hours.

test should be done every day when patients are receiving Heparin, Dicumarol or Tromexan for cases of Thrombosis. Thus a Prothrombin time of 12 seconds corresponds to 100% of the normal amount of Prothrombin. A reading of 20 secs. corresponds to 40% of the normal amount of Prothrombin and a reading of 80 secs. to 5%. If the Prothrombin time by Quick's method is above 30-40 sec. there is a great likelihood of haemorrhage. Thus, in cases of deficient absorption of Vit. K., there is an increase in Prothrombin time (reduction in prothrombin). If Vit. K. is administered, there is an increase in Prothrombin or decrease in Prothrombin time.

The intestinal absorption of Vit. K. of the diet seems to depend on the presence of bile and in conditions in which no bile reaches the intestines, as in biliary obstruction or biliary fistula, absorption of Vit. K. is defective. This failure in absorption is accompanied by a reduction in prothrombin which shows by an increase in Prothrombin time. Administration of Vit K. together with bile salts to patients with jaundice is followed by a sharp increase in prothrombin.

(k) The blood chemistry determinations are as follows:—

1. **Total proteins:** The normal range is about 6·5-7·5 gm. per 100 c.c.

Albumin—3·8 to 5·5 gm. per 100 c.c.
Globulin—1·5 to 3·5 gm per 100 c.c.

The total proteins is raised in cases of Addisons disease, multiple Myeloma and cirrhosis of the Liver. The total protein is reduced in cases of malnutrition, defective absorption or liver disease. If the total protein falls below 4 or 5 gm. per 100 c.c., oedema develops.

2. **Blood chloride:** The normal blood chloride level is between 570-620 mgm. per 100 c.c. as Sod. Chloride or 110 milli-equivalents of chloride per litre. Chlorides are diminished in cases of severe vomiting, Pyloric obstruction and in Addisons disease. This test is done before any major surgery is undertaken so that the electrolyte balance can be corrected satisfactorily.

CHAPTER 39

LABORATORY PROCEDURES

All surgical patients should have the following investigations done :—

Blood

(a) Routine total W.B.C., R.B.C. and differential counts.

(b) Hb. percentage or Hb. expressed in gms. per 100 c.c.

(c) Colour index,

(d) Blood picture.

(e) Haematocrit reading :—This will be of use in cases of burns where the haematocrit reading rises due to haemo-concentration. Reduction in haematocrit reading occurs in anaemia and an increase in Polycythaemia

(f) Platelet count is of great value in cases of haemorrhagic diseases. In Thrombocytopaenic purpura the platelets are greatly reduced The normal platelet count is between 2,00,000 to 4,00,000.

(g) Bleeding time, the normal being about 1-3 minutes is prolonged in cases of severe anaemia, Thrombocytopaenic purpura and diseases of the Liver. In cases of Haemophilia the bleeding time is normal.

(h) Coagulation time varies from 3-10 minutes and is delayed in cases of Haemophilia. In cases of Purpura Haemorrhagica and in non-thrombo-cytopaenic purpuras, the coagulation time is normal.

(i) *Erythrocyte Sedimentation Rate:* Is increased in Rheumatic infections, Tuberculosis and Myocardial infections It is also increased in acute infections. The normal Erythrocyte sedimentation rate is 1-3 mm per hour in the male and 3-7 mm. per hour in the female.

(j) *Prothrombin Time:* Prothrombin time by the Quick's method varies from 12-14 secs. and is increased in cases of severe liver disease, Vit. K. deficiency and leukaemias. This

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2. **Blood chloride:** The normal blood chloride level is between 570-620 mgm. per 100 c.c. as Sod. Chloride or 110 milli-equivalents of chloride per litre. Chlorides are diminished in cases of severe vomiting, Pyloric obstruction and in Addisons disease. This test is done before any major surgery is undertaken so that the electrolyte balance can be corrected satisfactorily.

3. **Blood calcium:** The normal value is about 9-11 mgm. per 100 c.c. or 4·5-5·5 milli-equivalent per litre. The blood calcium is decreased in cases of Hypo-parathyroidism, acute pancreatitis and nephritis. It is increased in cases of Hyper-parathyroidism.

4. **CO_2 combining power of blood:** The normal value being 55-75 Volumes percent. This is done as a routine before major abdominal surgery is undertaken. It is increased in cases of severe vomiting and alkali ingestion. The value is decreased in cases of diarrhoea, intestinal fistulae and renal insufficiencies.

5. **Blood Cholesterol:** The normal value is between 170-250 mgm. per 100 c.c. and is increased in cases of Myxoedema, diabetes, nephritis, biliary obstruction.

6. **Blood Non-protein Nitrogen:** The normal range is about 25-35 mgm per 100 c c. Blood urea especially rises in cases of Kidney diseases and decreases in cases of liver diseases. In cases of renal insufficiency, dehydration, shock, vomiting, diarrhoea and fever, the amount of non-protein nitrogen in the blood should be determined.

7. **Blood phosphate:** The normal value of inorganic phosphate is between 2·5-4·5 mgm per 100 c c. This is raised in cases of Hypoparathyroidism and Nephritis It is lowered in cases of Hyperparathyroidism and if it is less than 2·5 mgm. per 100 c.c it is of diagnostic value.

8. **Serum Acid Phosphatase and Serum Alkaline phosphatase:** This test is done in cases of malignant diseases. The alkaline phosphatase is increased in cases of Pagets disease, of bone, Rickets and Hyperparathyroidism. In certain malignant diseases of the bone and in cases of obstructive jaundice also, the value of alkaline phosphatase is raised

The serum acid phosphatase is raised in cases of carcinoma of the Prostate. The normal range of Acid Phosphatase value is 0·5 — 3·5 King Armstrong Units, and Alkaline Phosphatase 4 — 10 King Armstrong Units or 2 — 4 Bodansky Units.

9. **Blood Sugar:** The normal fasting blood sugar is from 80—120 mgm. per 100 c.c. If the value is above 140 mgm. per 100 c.c. it is diagnostic of diabetes. In all cases of glycosuria, a glucose tolerance test should be done as a routine, If the patient is having an Islet cell tumour or Addisons disease, Hypoglycaemia may be present.

The Glucose Tolerance Test is done as follows:—

Breakfast is omitted on the day of the test. Before the patient is given 100 gms. of Dextrose by mouth the patient is asked to empty his bladder and the urine is examined for any sugar. The blood sugar is also done. 100 gms. of Dextrose dissolved in 500 c.c. of water is given to the patient. Blood and urine examination for glucose is done every hour. This Test is of great value in the diagnosis of diabetes.

Liver Function Tests

The following tests are done to find out if there is any impairment of liver function. If there is any hepatic lesion it is usually accompanied by disorders of glycogen synthesis and storage, fat and amino-acid metabolism, secretion and excretion of bile. There are number of tests done but no single test affords a precise measure of severity of the lesion and it is only when the test is repeated at short intervals on the same patient, that a fairly reliable information may be secured concerning the degree of liver damage or the progression or regression of the lesion.

The first investigation that is done is "Icterus Index":— Normal blood serum has an Icterus index which is ordinarily between 4 and 6. It may increase to 15 units without the development of clinical signs of jaundice but it is generally assumed that values above 6 and certainly above 9 represent a condition of latent jaundice.

Vanden Berg Reaction

This test is based on Ehrlich's well-known diazo reaction. When Bilirubin is treated with a mixture of Hydrochloric acid, sulphanilic acid and Sod. Nitrite, a reddish or a

reddish violet compound—Azobilirubin is formed. The Vanden Berg reaction gives two types of results. Some sera give a colour directly on the addition of the reagent when it is called as "Direct Reaction", other sera require the addition of alcohol before the colour is developed and this is called as an "Indirect Reaction". The Normal Serum gives an indirect reaction.

The normal concentration of bilirubin is less than 0·25 mgm. per 100 c.c. In conditions like Haemolytic jaundice Hepatogenous jaundice and obstructive jaundice there is an increase in the serum bilirubin. In cases of aplastic anaemias, secondary anaemias particularly those associated with malignant tumours, bilirubin production is lowered.

Bilirubin concentrations of 30-50 mgm. per 100 c.c. are not uncommon in severe hepatogenous jaundice (Toxic and infectious injury to the liver cells) and in neoplastic biliary obstruction If the value is between 10 — 30 mgm the liver damage is not very severe. If the concentration is between 2 and 10 mgm. there is a mild degree of hepatitis. Determination of Serum bilirubin at frequent intervals is often the surest way of establishing the trend in patients with jaundice.

Urobilinogen

The bilirubin is converted into Urobilinogen by bacteria in the intestines. A part of it is excreted in the stool, the rest being reabsorbed and carried to the liver in the portal blood stream.

A small amount may escape into the general circulation to reach the kidney and is eliminated in the urine. The amount of Urobilinogen excreted by the normal adult in the urine in 24 hrs. may vary between 0 — 4 mgm. The Urobilinogen content of the faeces varies between 40-280. mgm per day.

The Bilirubin Excretion Test

In this test devised by Eilbott the rate of disappearance of intravenously injected bilirubin is determined. The dose

is 1 mgm. of bilirubin per kgm. body weight with a maximum dose of 70 mgm. Three blood specimens are taken; one before injection and the 2nd and 3rd, 5 minutes and 4 hours respectively after the injection. In normal persons 4 hours is sufficient time for the excretion of all, or nearly all of the pigment. Bilirubin excretion test is a reliable one for the detection of impaired hepatic function. In health 0·5% retention occurs in the 4 hours specimen of blood.

Brom-Sulfalein Test

In this test Brom-sulfalein (Disodium Phenol Tetra brom phthalene sulphonate) is injected. The dye is rapidly removed by the liver and excreted in the bile. The recommended dose is 5 mgm. per kgm. body weight. 1 hour after the injection a specimen of blood is collected and the concentration of dye in it is determined. No dye is present in the blood after 45 minutes in a normal person. This test is found to be very reliable in disclosing parenchymatous hepatic damage or moderate mechanical obstruction of bile ducts before the lesion has advanced to the point of producing clinically demonstrable jaundice.

Hippuric Acid Test

This test depends on the property of the liver to convert Benzoic acid into Hippuric acid. The standard dose recommended is 6 gm. of Sod. Benzoate taken orally. The urine is collected every hour for 4 hours and the amount of Hippuric acid estimated. The normal adult excretes approximately 3 gms. of Benzoic acid in the form of Hippuric acid. According to Quick a low output of Hippuric acid occurs in cases of catarrhal jaundice, Hepatitis and other liver disorders. If the output is less than 1·5 gm. the liver damage is very severe and the prognosis bad. In cases of hyperthyroidism the Hippuric acid output has been on an average 40% below normal.

Intravenous Test: Hippuric acid Test.

(a) Omit breakfast.

(b) Patient passes urine first before the I.V. injection.

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Colour, Acidity, Sp. Gravity, Albumin, Sugar, Acetone, Bile and Sediment.

The three abnormal urinary constituents associated with renal lesions are proteins, casts and RBCs. In addition, the colour and Sp. gr. are also of significance. Albumin may be detected by any one of the simple tests:—the most common being heat coagulation with acetic acid or the Nitric acid ring test.

Normal urine is not entirely devoid of protein but the amounts are usually too small to give a positive test by ordinary methods. Daily excretion varies between 20-80 mg.

Bence Jones Proteinuria named after its discoverer was first observed in the urine of patients with Multiple Myeloma. Occasionally it occurs in other conditions like Hodgkins disease, Leukaemia and lymphosarcoma. When the temperature of the urine is about 50-60°C the protein separates from the urine and forms a thick coagulum. As the temperature is raised the protein redissolves and on cooling it reappears.

The normal concentration of the Non-protein Nitrogenous blood constituents are as follows:—

Total N.P.N.	— 25—35 mgm. per 100 c.c.
Urea Nitrogen	— 12—18 mgm. per 100 c.c.
Uric acid	— 1·5—4 mgm. per 100 c.c.
Creatinine	— 1—1·8 mgm. per 100 c.c.
Amino acid Nitrogen	— 5—10 mgm. per 100 c.c.

Normally these substances are excreted at such a rate that their concentration in the blood are maintained approximately within the indicated limits, but with the development of renal insufficiency, their excretion is diminished and hence they accumulate in the blood.

Renal Function Tests: (1) Phenolsulphonphthalein Test. The drug is injected I.M. or I.V. and the amount excreted

(c) 20 c.c. of a sterile aqua. solution containing 1·77 gm. of Benzoate is given I.V.

(d) 1 hour after the injection, the urine is collected and analysed.

In the I.V. test the total excretion is about 0·7 gm. of Sod. Benzoate as Hippuric acid.

Cephalin Cholesterol Flocculation Test

This test depends upon the changes in the serum albumin and globulin. 1 + to 4 + is seen in cases of cirrhosis, hepatitis and neoplasms of the liver.

The normal albumin globulin ratio is 2 : 1. In certain cases of liver damage, the ratio may be 1:1 or it may even be reversed as in certain cases of cirrhosis of liver. The plasma globulin in particular undergoes a change in certain cases of liver damage. In the Cephalin Cholesterol Flocculation test the globulins flocculate in the Cephalin cholesterol emulsion in varying degrees. The test is used to demonstrate the amount of flocculation and precipitation. It varies from 1 + to 4 +.

Proteins: Total plasma proteins should be done in all cases of hepatic diseases and in cirrhosis. The albumin globulin ratio is invariably inverted. Plasma protein deficiency also occurs in cases of catarrhal jaundice, malignancy and other diseases of liver, but the inversion of albumen globulin ratio does not occur as regularly as in hepatic cirrhosis.

Thymol Turbidity Test

The normal range is 0-6 units. 6-12 units suggest early obstructive jaundice—values above 12 units are seen in cases of severe liver damage.

Renal Function Tests

Routine examination of urine involves the following determinations:

time blood is withdrawn from the vein. At the end of the 2nd hour the patient again voids completely and the time again accurately recorded and the specimen saved for analysis. Each specimen of urine is accurately measured and analysed for its content of urea and urea nitrogen. The urea nitrogen of the blood is also determined:

Calculation: If the urine vol. exceeds 2 c.c. per minute the maximum clearance is calculated by the following formula:—

$$\text{Max. clearance as \% of normal} = \frac{100 \times U \times V}{b \times 75.}$$

U = Urine urea in mg. per 100 c.c.
b = blood urea " "
V = Vol. of urine excreted in c.c. per minute.

In health the maximum clearance varies usually between 60 and 100, but the accepted average is 75 c.c. The standard clearance also shows considerable variations, usually between 40-65 c.c., the accepted average being 54 c.c.

Calculation *for standard* clearance.

$$\text{Standard clearance} = \frac{100 \times U \times V}{5\ U \times b.}$$

Concentration and Dilution Test will detect very early renal impairment. This test is based upon the sp. gr. of two specimens of urine voided, at hourly intervals in the morning.

(1) The patient takes a high protein supper with a limited amount of fluids at 6 p.m. on the evening before the test. (2) Before retiring, the patient empties the bladder and discards the urine. Any urine voided during the night is also discarded. (3) In the morning the patient voids and the specimen is saved in a bottle which is labelled No. 1. The time also should be recorded. 1 hr. later a second specimen which the patient passes is collected in a bottle No. 2. 1500 c.c. of water is then taken by the patient within half an hour. The bladder is then emptied at hourly intervals for four hours and the specimens are labelled as 3, 4, 5 and 6 The sp. gr. and volume of each specimen is determined.

during the first two hours is determined. The test may be performed as follows:—

(a) The patient is prepared by giving him 300-400 c.c. of water by mouth.

(b) 20 minutes later the bladder is emptied.

(c) The dye (6 mg.) which is available in sterile ampoules is injected I.M. or I.V. and the time is noted.

(d) If the drug is given I.M. the patient is asked to empty his bladder at the end of 1 hr. 10 minutes. A second specimen of urine is again collected at the end of 2 hrs. 10 minutes. The extra 10 minutes is allowed for the dye to pass into the circulation completely.

If the injection is I.V. the 2 specimens are collected at the end of 1 and 2 hrs. respectively. The specimens are then tested separately after making it alkaline with Sod. Hydroxide. Normally 40—60% of the dye is excreted during the 1st hour, and sufficient amount is eliminated during the 2nd hour to make the total excretion about 60—80%. In diseases of the Kidney the output of the dye will be reduced to about 10% or below.

Urea Clearance Test: This test is based upon the quantity of blood cleared of Urea per minute while passing through the Kidneys. The maximum urea clearance ranges from 60-100 c.c per minute. When the output of urine is less than 2 c.c. per minute, the volume of blood cleared of urea each minute varies from 40-60 c.c. This is known as the standard clearance. If the kidneys are normal the clearance is about 60% and in cases of renal impairment the clearance varies from 20-40%. In very bad cases the clearance may be below 20%.

The test is usually performed in the morning between breakfast and lunch. The patient is given 2 glasses of water (200 c.c) one at the beginning of the test and the other one hour later. After drinking the first glass of water the patient empties the bladder completely. The time is noted and at the end of 1 hour the patient again empties his bladder. This specimen of urine is saved for examination. At this

days daily. This will lessen the nervous tension before the readings can be taken.

Basal metabolism is increased in cases of thyrotoxicosis, fever, heart failure and pregnancy. It is decreased in cases of hypothyroidism, malnutrition and hypopituitirism. The normal range of the basal rate is usually given as plus 10 to minus 10.

In cases of hyper-thyroidism the basal rate may go up to plus 60. Hence these patients are given Thiouracil first and later Iodine for several days before a sub-total thyroidectomy is undertaken.

Before the advent of Thiouracil only Iodine was given for these patients. The action of Iodine is to cause a fall in the basal metabolism and at the same time to keep it constant before surgery is undertaken. In some cases after an initial fall in the basal metabolism the drug was not able to prevent sharp rise and control the toxicity of the patient. When such a thing happens, surgery undertaken at a period when the B.M.R. is tending to rise may precipitate a thyroid crisis. Thiouracil on the other hand inhibits the formation of thyroxin and reduces the raised metabolism of thyrotoxicosis to normal. Iodine is given just before operation for a week or ten days to not only act as a synergist for Thiouracil but also reduce the vascularity of the thyroid before operation.

Fractional Test Meal

The analysis of the gastric contents together with the knowledge of the secretory power of the stomach affords considerable aid in the diagnosis of a case of suspected gastric or duodenal disease.

The fractional test meal: The patient takes his usual meal the previous evening at about 8 O'clock. All drugs which he had been taking are suspended. The following morning at [illegible] O'clock the patient swallows the Ryle's tube and when it is in position the whole of the fasting contents of the stomach are aspirated by a record syringe

In a normal individual either No. 1 or No. [redacted] specimen should have [redacted] specific gravity of more than 1030. Renal insufficiency is indicated by consistent low specific gravities.

The value of this test is that no special Laboratory facilities are required.

The Sp gr. of later specimen usually fall below 1010 and the patient should have excreted the greater part of the 1500 c.c. of fluid he has taken. In some patients the excretion of water may be delayed either from Renal deficiency or from other reasons such as cardiac failure or oedema from other causes.

Urea Concentration Test

This test is done as follows :—

The patient must not have anything to drink since the previous evening. The Test is carried out early in the morning. The bladder is completely emptied before the patient takes 15 gms. of urea in 100 c.c. of water by mouth. The bladder is again emptied at hourly intervals till three specimens are collected The amount of urea in each specimen must be estimated Normally at least one specimen must show an excretion of more than 2·5 gm % in the urine. Values less than [redacted] 5 gm % suggest impaired Renal function.

Basal Metabolism

This is defined as "The lowest output of heat that the body produces". Various factors alter the basal metabolism of an individual. Exercise, anxiety, food of high protein nature and alterations in room temperature and body temperature bring about [redacted] change in the basal metabolic rate Menstruation and pregnancy also influences the basal metabolism

Preparation: The patient is starved for twelve hours before the test is undertaken. He should lie in bed or in a couch for at least one hour. To avoid any errors in the readings the patient must have the B.M R done for [redacted] or 3

excess of mucus is found. The presence of pus cells usually indicates carcinoma, if pus swallowed from nose and throat are excluded.

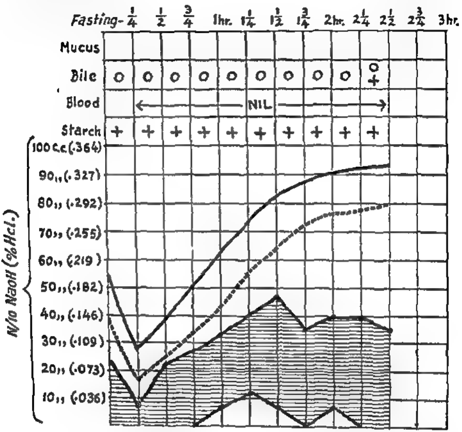

Fig 67 (a) Duodenal ulcer—climbing curve The resting juice is highly acid and the free total Hcl are rising during the whole meal with delayed emptying of the stomach.

The F.T.M. charts help the surgeon to find out whether the patient is having a gastric ulcer, duodenal ulcer or carcinoma of the stomach. In a gastric ulcer both the total and free Hcl. are within normal limits, blood may be present in a few of the specimens In a duodenal ulcer the patient has a climbing curve denoting a high acidity. In carcinoma of the stomach the typical finding is the absence of free Hcl. together with the presence of blood in some or all of the specimens. This achlorhydria occurs in over 50% of cases. The presence of free Hcl in the stomach does not exclude a diagnosis of

attached to the end of the tube. When the stomach is empty the patient is given a pint of oat meal to drink.

This meal is prepared as follows: Two tablespoonfuls of oat meal are mixed with two pints of water and allowed to boil slowly until the volume is reduced to a pint. The gruel is then filtered before giving it to the patient to drink. The time is noted; every fifteen minutes, 15 c.c. of the gastric contents are aspirated through the Ryle's tube which has been left in position. The aspirated material is transferred to a series of test tubes each bearing a label corresponding to the time that the contents of the stomach are aspirated At the end of 2½ hours if material can still be aspirated, it should all be withdrawn and its volume noted. Normally the stomach empties in 2½ hrs. While the test meal is being performed the patient can be allowed to read a book or talk to his friends.

The normal fasting stomach contents have a volume usually between 20 to 60 c.c. If it is more than 60 c.c. this should be regarded as either due to hypersecretion or to pyloric obstruction.

Colour: The colour of the resting juice is usually clear sometimes it may be bile stained from regurgitation through the duodenum. In pyloric obstruction bile is absent. When blood is present it may be due to trauma produced by the tube or it may indicate the presence of an ulcer or carcinoma of the stomach.

Odour: The resting juice is normally odourless but in pyloric obstruction and carcinoma it is offensive due to fermentation and decomposition. The consistency of the resting juice is usually thin but in cases of gastritis and carcinoma it becomes thick and viscid If the resting juice contains particles of food taken the previous day or earlier this indicates a pyloric obstruction.

Microscopic examination of the resting juice is done as a routine and normally a few epithelial cells, leucocytes and a little mucus are present. In chronic gastritis and carcinoma

stomach the F.T.M. chart may show an increase in the total acid curve owing to the presence of organic acid, and an absence of free Hcl. Blood is present in some or all of the specimens and the specimens are foul smelling. Thus the presence of achlorhydria and blood in all the specimens are highly suggestive of carcinoma.

Occult blood test: The examination of the stools for occult blood, forms an important part of the investigation and should never be omitted.

Preparation of the patient: Before collecting stools for examination, the patient should have a mild aperient for 2 or 3 days. If the patient is not constipated the laxative may not be necessary. Meat, meat extracts and all the green vegetables are omitted. Medicines containing iron and iodides are not given. If the patient has any tendency for bleeding of gums he should be asked only to wash his mouth and not use a tooth brush for a couple of days before the test. A small dose of charcoal biscuit is given and its appearance in the faeces is noted. A specimen of faeces passed subsequently and clear of charcoal is taken for examination.

Two chemical tests may be done:—

(i) Guaiac test and (ii) benzedine test. In various intestinal conditions where small haemorrhages occur the test is of value in diagnosis. Many factors may lead to a positive result. But a negative test is of much greater significance. If one gets negative result on every day or on alternate days, haemorrhage from the gastro-intestinal tract may be safely excluded.

carcinoma while on the other hand the absence of free acid is not in itself diagnostic of malignant disease. The absence of Hcl. is seen in cases of chronic gastritis and pernicious anaemia. Thus a histamine test is done for these patients.

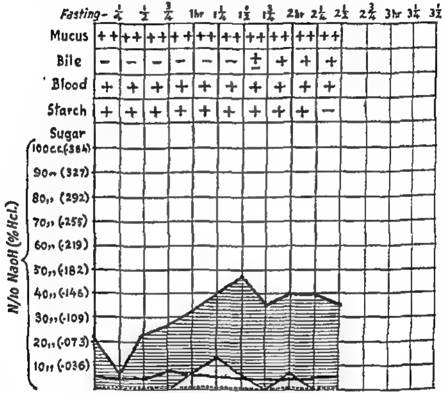

FIG 67 (b) Carcinoma of the stomach with absence of free acid and *low total acidity Blood and excess of mucus in all the specimens.*

Histamine test: 0 5 mg. of histamine is injected subcutaneously and the gastric contents are collected. In pernicious anaemia there is always a complete achlorhydria. This is resistant to histamine in *contradistinction to the achlorhydria* of chronic gastritis which usually responds to histamine by secretion of hydrochloric acid.

The demonstration of a histamine fast achlorhydria in a patient suspected of pernicious anaemia is the most valuable function of a test meal in surgery. In a carcinoma of the

the Barium emulsion in the mouth and the Radiologist screens the patient while he is swallowing the emulsion.

Pharynx: Radiology has been found useful in confirming the clinical diagnosis and in assessing the extent of the disease. Soft tissue films and tomograms will reveal information which cannot be obtained by any means other than surgery. Patients who have pharyngeal diverticulum present a charateristic radiological appearance. If the diverticulum is sufficiently large, the barium enters and fills up this pouch. Screening and plain X-Rays of this region may help us to diagnose the position and the size of the diverticulum.

FIG. 63 (a) P. A view of patient with a foreign body in the oesophagus

In cases where the patient has swallowed or aspirated, a foreign body, a plain X-Ray of the neck or chest is very useful to find out the exact position before any treatment is undertaken.

CHAPTER 40

RADIOLOGICAL INVESTIGATIONS

Before an X-Ray examination of certain parts of the body, it may be necessary to remove any articles that may mask the details of the part under investigation. No radio-opaque object should be present on the part of the body where an X-Ray examination is being done. Garments made of silk or embroidered with silk, buttons, buckles and jewels should be removed. Belts, trusses and water proof material are also radio-opaque and should not be present in the field. Dentures and hairpins, if present, are removed before an X-Ray examination of the face, mouth, skull, nasal sinuses or neck is done The other objects which should be removed are spectacles and artificial eye if the patient has one.

Adhesive plaster and elastoplast are less radio-opaque than plaster of paris, but may hide an early callus or crack in the bone and it is therefore desirable to have cases X-Rayed without them.

Investigation of the gastro-intestinal tract is done by two methods:

1. A Barium meal series,
2. A Barium enema examination.

By the Barium meal series, the pharynx, oesophagus stomach, intestines and colon could be visualised and any alteration in the normal contour or appearance of the gut could be revealed by the above method. In cases of diseases of the colon, a Barium enema examination may be of help. The following procedures are done by the Radiologist:—

Barium swallow: This examination is used to demonstrate any cardiac abnormality as well as diseases of the pharynx and the oesophagus. The patient is asked to keep

Stomach, Duodenum and small Intestines: Preparation of the patient :—

1. No purgative or laxative should be taken on the morning of examination or evening preceding it.

2. The patient is allowed to have a light diet the previous evening.

3. No solids should be taken on the day the Barium meal series is done.

FIG. 69 Diagram showing a filling defect in the oesophagus after a Barium swallow.

Preparation of the meal: This consists of 4—6 oz. of the Barium food with 1 pint of hot water to make it into a thin cream. For the examination of the Oesophagus, a thicker cream may be required. Satisfactory X-Ray investigation of the stomach and duodenum depends on the taking of an adequate series of radiograms. Screening also should be done along with it.

Oesophagus: Oesophageal lesions, congenital or acquired can be confirmed radiologically.

FIG 68 (b) Lateral view of the same patient showing the position of the foreign body.

Atresia of the Oesophagus: The history of the patient is, that the baby chokes and becomes blue, and regurgitates as soon as it takes a feed. Immediate recognition of this condition is necessary and can be confirmed radiologically. The blind sac may be demonstrated by instilling 2 or 3 drops of lipiodol through an oesophageal catheter.

Cardiospasm: This can be easily demonstrated by giving the patient some Barium to swallow The radiological picture is quite characteristic Oesophageal growths and strictures can also be diagnosed by Barium swallow examination and by taking radiograph, after the patient swallows the Barium.

and the fluid is allowed to flow by gravity into the colon. The can is raised gradually to a height of about 3′ 6″ as it empties. Pictures are now taken. After evacuation, another picture is taken.

FIG. 70. A Barium enema picture showing a filling defect in the right half of the colon.

Cholecystogram: Careful preparation of the patient is essential to prevent any gas shadows overlapping the region of the gall-bladder. Plain X-Ray of the abdomen PA (*prone*) as well as oblique view and lateral views are taken to see if there are any gall stones.

Preparation of the patient for Cholecystogram:

1. A laxative is given on the first day.
2. Light diet is taken in the morning and afternoon.
3. The dye is taken on the evening of the 2nd day.

The following pictures are taken for the investigation of the stomach and duodenum :—

1. 15 minutes after Barium meal.
2. 3 hours after,
3. 6 hours after, to find out if there is any Barium residue still left in the stomach which is of pathological importance.
4. 24 hours picture may demonstrate the appendix, caecum and ascending colon; and
5. the 48 hours picture may demonstrate the colon and its rate of emptying and whether there is any stasis in the appendix.

Thus, by a Barium meal series, ulcers in the duodenum or stomach, growths in the stomach and lesions in the small intestines and colon could be diagnosed. If a patient is having a duodenal ulcer, the duodenal cap is best investigated by taking a series of spot radiographs.

Barium enema: This procedure is done to find out if the patient is having any stricture, growth or diverticulum of the large intestines.

Preparation :

1. Patient gets a laxative at night on the first day.
2. Light diet is allowed on the second day.
3. A bowel wash on the evening of the second day.

On the third day, the patient gets another bowel wash just an hour before the X-Ray examination. Light breakfast is allowed on the day of investigation.

Preparation of Barium enema. The shadow food in the ratio of one part of the food to three parts of water is taken and 2 to 3 pints of this mixture is made. The patient is allowed to lie down in the left lateral position and a flatus tube is passed 4″ to 5″ into the rectum and this is connected to the enema can, which contains the above solution. The enema can is now raised to about 3 feet above the patient

and the fluid is allowed to flow by gravity into the colon. The can is raised gradually to a height of about 3′ 6″ as it empties. Pictures are now taken. After evacuation, another picture is taken.

FIG. 70. A Barium enema picture showing a filling defect in the right half of the colon

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Preparation of the patient for Cholecystogram:

1. A laxative is given on the first day.
2. Light diet is taken in the morning and afternoon.
3. The dye is taken on the evening of the 2nd day.

Patient should not take any laxative or food after the dye is taken. Plenty of water is allowed for the patient to drink in the night or in the evening.

On the third day (16 hours after the dye is ingested), X-Ray pictures are taken. A fatty meal is then given and another film taken one to two hours later. If the patient is very thirsty during this procedure before the fatty meal, he is allowed to take coffee without sugar or milk. The fatty meal is composed of bread and butter or bread, butter and an egg. This is given to stimulate the gall bladder to contract and the X-Ray film taken now, will show the size of the gall bladder.

FIG. 71 Diagram showing a stone in the gall bladder.

Urinary tract: Before doing an intravenous pyelography or retrograde pyelography, the following preparation should be done to eliminate all gas in the intestinal tract as it is likely to obscure the urinary tract.

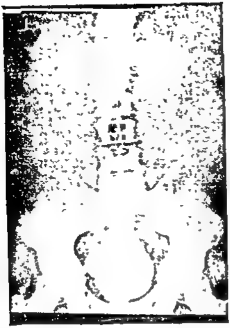

FIG 72 Diagram showing a giant calculus in the bladder.

FIG. 73. Diagram showing bilateral renal calculus.

Patient should not take any laxative or food after the dye is taken. Plenty of water is allowed for the patient to drink in the night or in the evening.

On the third day (16 hours after the dye is ingested), X-Ray pictures are taken. A fatty meal is then given and another film taken one to two hours later. If the patient is very thirsty during this procedure before the fatty meal, he is allowed to take coffee without sugar or milk. The fatty meal is composed of bread and butter or bread, butter and an egg. This is given to stimulate the gall bladder to contract and the X-Ray film taken now, will show the size of the gall bladder.

FIG 71 Diagram showing a stone in the gall bladder

Urinary tract: Before doing an intravenous pyelography *or retrograde pyelography, the following preparation* should be done to eliminate all gas in the intestinal tract as it is likely to obscure the urinary tract.

On the morning of the examination, the patient can have light breakfast. A plain X-Ray of the genito-urinary tract (K.U.B., i.e. Kidney, Ureter Bladder region), is taken to see if there is any calculus.

Intravenous Pyelography: 20 c.c. of Uroselectan or Diodone is given intravenously for an adult. After the injection some patients complain of flushing of face, palpitation, nausea, vomiting and thirst. Sometimes a patient may become cold and clammy and the pulse may become feeble.

FIG 75. Diagram showing an intravenous pyelogram with normal appearance of the calyces and pelvis.

Stimulants like coramine and adrenaline may have to be given to stop these reactions In cases of infants, an intramuscular route is preferred. X-Ray pictures are taken at intervals of 5, 15, 30 and 60 minutes. In the infants X-Ray pictures should be taken at intervals of 3, 6, 9, 12 and 15 minutes. In any event the immediate deve-

Preparation: On the first day, a laxative is given at night. Violent purgatives should be avoided. If the aperients fails or the examination is required so urgently that it leaves no time for preparation, then an enema should be given. To eliminate the gas and fluid left behind after the enema, 0 5 c.c. of Pituitrin may be given subcutaneously 20 minutes before commencing the examination. The disadvantage of giving Pituitrin is that it may produce severe colic and is contra-indicated in cases of hypertensive patients especially the aged one. In some patients, it is advisable to give 3 or 4 days before the intravenous pyelography, charcoal lozenges or Taka diastase by mouth.

FIG. 74. Diagram showing a calculus in the left renal pelvis, treated by pyelo-lithotomy.

Diet: Diet should be very light and as far as possible free from residue. Fluid intake must be restricted and should be minimum for about 8 hours before the X-Ray pictures are taken The object is to make the urine as concentrated as possible with consequent improvement in the shadows caused by the medium.

are then injected and if after 10 c.c. the patient complains of pain in the loin, the injection is stopped and X-Ray picture taken. In cases of Hydronephrosis, 20 c.c. and sometimes even larger amounts of Sodium Iodide can be injected upto the point when the patient complains of pain in the loin. Over distension of the calyces and pelvis may result in a rupture and the patient may complain of excruciating pain. After the films have been taken, the catheters are removed.

Intravenous pyelography is a useful method to find:

(a) the functional capacity of each kidney;

(b) the size, shape and position of the kidney, ureter and bladder;

(c) to assist in the identification of shadows in relation to the upper parts of the urinary tract, and information regarding their effect upon function and anatomy.

Intravenous pyelography is contraindicated in cases of severe renal and hepatic insufficiency, acute inflammation of the kidney, advanced cardiac disease, thyrotoxicosis and severe anaemia. It should not be performed if the patient is sensitive to iodine. A blood urea estimation is an useful guide in finding out whether an I.V.P. can be done.

Retrograde pyelography is contra-indicated in cases of acute inflammations of the urinary tract. This method is of value to find out even the smallest irregularity in outline and thus it is helpful to get a clear picture in cases of malignant disease, Tuberculosis of the Kidney, etc. The disadvantage of this method is that congenital abnormalities like a bifid kidney or partially reduplicated ureter may be completely missed.

Cystogram: Examination of the bladder is made after the introduction of contrast medium into the bladder. The bladder should be emptied completely and then filled with 6 to 8 oz. of 8-10% solution of Sodium Iodide. Anterio-posterior, right and left oblique radiograms should be taken. By this method, growths in the bladder and diverticula have been

lopment of the early films will indicate whether longer or shorter intervals between subsequent exposures will be advantageous.

Retrograde Pyelography: The patient is prepared as for intravenous pyelography. Cystoscopy or catheterisation of one or both ureters is performed by the surgeon under

FIG 76. Diagram showing Retrograde pyelogram. The pelvis and calyces are filled with dye. The opaque uretary catheters are seen showing the position of the ureter

general or local anaesthesia. After the ureteric catheters have been passed, the patient is wheeled to the Radiological department. A plain X-Ray of the abdomen is taken to demonstrate the ureteric catheters if opaque. Sodium Iodide 12½% solution is injected into each ureter and after 7 c.c. has been injected, a picture is taken to see the size of the pelvis and its shape. Increasing amounts of Sodium Iodide

With the left finger in the rectum as a guide, a lumbar puncture needle is passed in front of the tip of the coccyx and behind the anal canal and rectum for about 3" care being taken not to pierce the rectum or enter into any vein. Gas is now introduced by connecting the artificial pneumothorax apparatus to the Lumbar puncture needle. About 400—500 c.c. are required and Oxygen is the medium of choice. This method outlines the kidney and clearly differenciates it from retroperitoneal masses, e.g., suprarenal tumours. Any form of sepsis round the anal region contraindicates this procedure.

FIG 77. Peri-renal pneumogram showing the outline of the kidneys.

Renal arteriography: This may be the only method for diagnosing an aneurysm of the renal artery. This method may also demonstrate aberrant arteries to the kidney. Tumours which cause a slight distortion in the pyelogram may be more clearly defined, thus assisting in early diagnosis.

clearly seen. Occasionally air plus an opaque medium gives features which cannot be obtained by the use of separate substances. Pneumocystography must be done with great care because of the danger of air embolism.

Urethrography: Urethrography in the male forms a valuable means of investigation in certain urethral and prostatic conditions. Iodised oil has been used as contrast medium and is injected with a urethral syringe. If the anterior urethra has to be examined, the end of the penis may be compressed with a penile clamp and radiograms taken. In case of the posterior urethra, some more of the opaque medium should be injected to replace the solution that is leaking into the bladder and radiograms taken as quickly as possible to visualise the membranous and prostatic portions of the urethra.

Vesiculography: This may be defined as the visualisation of the lumen of seminal vesicles, vas-deferens and ejaculatory ducts by the injection of a contrast medium. The object of the procedure is to demonstrate the patency of these ducts. Lipiodol is the medium usually employed and it gives a clear picture of the vesicles and is without harmful effects. Injection of this Lipiodol is done directly into the vas deferens in both directions after it has been exposed in the inguinal region under local anaesthesia. The Lipiodol will fill up the vesicles as well as the epididymis and thus the patency of the tract may be investigated.

Peri-renal Insufflation: The object of this method is to improve the definition of the renal outline in the radiogram. It is done by injecting gas into the perirenal tissues. This method is not in any way superior to I.V.P. for cases of kidney diseases, but is found to be of real value in the examination of the suprarenal glands. The most important danger in this method is a fatal air embolism which has been recorded more than once in the literature.

Technique: The patient is made to lie in the left lateral position. The skin is anaesthetised over the tip of the coccyx.

With the left finger in the rectum as a guide, a lumbar puncture needle is passed in front of the tip of the coccyx and behind the anal canal and rectum for about 3″ care being taken not to pierce the rectum or enter into any vein. Gas is now introduced by connecting the artificial *pneumothorax* apparatus to the Lumbar puncture needle. About 400—500 c.c. are required and Oxygen is the medium of choice. This method outlines the kidney and clearly differenciates it from retroperitoneal masses, e.g., suprarenal tumours. Any form of sepsis round the anal region contraindicates this procedure.

FIG 77 Peri-renal pneumogram showing the outline of the kidneys.

Renal arteriography: This may be the only method for diagnosing an aneurysm of the renal artery. This method may also demonstrate aberrant arteries to the kidney. Tumours which cause a slight distortion in the pyelogram may be more clearly defined, thus assisting in early diagnosis.

Technique: A large bore 12 or 14 guage hypodermic needle is introduced through the skin into the femoral artery. By way of this needle a polyethylene catheter is passed to the desired level in the abdominal aorta and X-Rays are taken after injection of radio-opaque medium with an ordinary syringe. If two to three c c. of radio-opaque medium is injected at the time the first film is made, it serves to test the patient's sensitivity and accurately locates the tip of the polyethylene tubing. Repeated pictures can be taken with the catheter tip and the patient, repositioned as desired

Best renal arteriograms are obtained with 10 to 12 c.c. of 70% Urokon sodium. Percutaneous method appears to be a safer and simpler method of doing renal arteriography. No thrombosis, infection or secondary haemorrhages occur by this method

The possible complications are haematoma formation, discolouration of skin at the site of puncture and sometimes haemorrhage. Patients should be tested for sensitivity to the opaque medium and the usual drugs to combat reactions should be available.

Renal arteriography is contra-indicated in persons with severe acute or chronic nephritis, acute or chronic pyelonephritis, severe liver disease, hyper-thyroidism, pulmonary tuberculosis and sensitivity to iodides. The chief advantage of retrograde arteriography by the closed method of catheterisation, over the trans-lumbar method of arteriography lies in its ability to place the catheter accurately at any desired level in the aorta and to obtain excellent arteriograms of the kidneys, adrenal glands, spleen and liver. Renal arteriography is not a substitute for intravenous or retrograde pyelography but supplements them. This method is valuable in diagnosis of .—

(a) Diseases affecting blood supply of the kidney, (b) Congenital anomalies of the kidney, (c) Renal neoplasm, (d) Renal cysts (e) Hydronephrosis. (f) Adrenal tumour. (g) Diseases of the aorta and branches.

Trans-lumbar aortagraphy is a good method of finding the relative over-all status of the kidneys. Excluding a neoplasm, a good arterial supply to a kidney indicates conservative surgery on the kidney, where as a poor blood supply prompts its removal. Occlusion of the main arterial tree, appreciable reduction in larger intra-renal vessels, absence of smaller intra-renal vessels and relative lack of arterial supply indicate nephrectomy.

(a) (b)

FIG 78 Diagram (a) & (b) showing trans-lumbar aortagraphy. The renal arterial pattern is brought out clearly and the dye escaping through the ureter also is seen in the diagram.

The trans-lumbar needle method is a simple and less hazardous procedure and should be the choice in suitable cases. The technique is that of Dos Santos who described this method 20 years ago. A fifteen centimeter needle with a seventeen gauge bore is used for injecting the dye. About 25 to 30 c.c. of the dye is injected by hand through the seventeen gauge needle. Except for transient pain, drug toxicity

or idiosyncrosy and occasional trauma to the renal artery or its branches, this method is safe.

Venography: If a picture of the short saphenous system or of the veins of the popliteal fossa is required, the radio-opaque dye is injected into the small veins on the outside of the foot. In cases where the long saphenous vein, and its communicating branches with the deep veins are to be seen, the injections should be made into the lower part of the long saphenous vein near the medial malleolus. About 20 ml. of diodrast are injected in about 20 seconds and a skiagram is taken as soon as the injection is completed. There are practically no disadvantages and the method is safe because of the rapid excretion of the drug and the absence of phlebitis or any pain.

Portal venography is the most useful investigation on all patients with portal hypertension on whom a porto-caval shunt is contemplated. The technique consists in the injection of 30 ml. of 70% iodine contrast medium into the spleen by a needle inserted through the parieties. The injection is made as rapidly as possible and the first X-Ray picture is taken as the injection is completed. The anatomy of the left gastric, splenic, portal veins, and the varices around the cardia are shown clearly. In cases of intra-hepatic obstruction, some of the contrast medium passes through the liver, but most of it goes by the left gastric vein to the varices. Some of the medium may enter into the intercostal vessels through the anastomosis in the spleno-renal ligament. Mural thrombi in the portal vein may show as filling defects or may narrow the whole vein. This investigation may help the surgeon to determine whether the portal vein is suitable for a porto-caval anastomosis. If the obstruction is extra-hepatic, the anatomy of the portal and splenic veins will show the type of obstruction and thus help in the planning of the operation necessary for its relief. This investigation can be done only if the spleen is enlarged and the usual precautions should be taken as for a case of splenic puncture. After the investigation, the patient must be carefully watched and a half-hourly pulse chart maintained.

Fig. 79. Diagram showing spleno-porto venogram. The dye is injected into the spleen

Fig 80. Diagram showing oesophageal varices at the lower part of the oesophagus after a Barium swallow.

Respiratory tract: Bronchograms are done to investigate the bronchial tree. Sterilised iodised oil or lipiodol is used to outline the bronchial tree. This can be injected into bronchial tree by any one of the following methods: —

1. A needle of wider bore is inserted into the trachea and lipiodol is injected. Before introducing the needle, the skin over the trachea is anaesthetised and a fine needle is passed into it below the cricoid cartilage and cocaine is sprayed to abolish cough reflex.

2. Another method that has been used is to cocainise the pharynx and larynx first. The tongue is then pulled forwards and lipiodol is injected through a catheter which has been passed over the back of the tongue and while the patient is taking deep breaths, the lipiodol should be injected slowly. It is essential to assure the patient that the oil is harmless and he should be encouraged to cough after the examination is completed so that he could expectorate all the oil that has gone into the bronchial tree. Cocaine sensitivity should be tested before a bronchogram is done.

Central Nervous System: The following investigations are done to obtain information as to the exact situation and nature of lesions of the central nervous system.

Myelography: In cases of obstruction in the spinal canal, localisation can be made by injecting into the subarachnoid space opaque media. A cistern puncture is done and about 2 to [illegible] c.c. of lipiodol is injected. The oil being heavier than the c.s.f. runs down the spinal canal till the end, unless it is obstructed by a block. Thus for cases of intraspinal tumours, protruded intervertebral discs etc., this procedure has been of great help to localise the exact site of lesion.

Encephalography: By this method, air or oxygen is introduced, to fill the cerebro spinal fluid spaces in and around the brain and spinal cord.

1. The c.s.f. pressure must first be determined with the patient lying in the horizontal position.

2. Breakfast is omitted in the morning if the encephalography is to be done before noon.

3. An injection of scopolamine is given to allay any fear.

The patient is anaesthetised and a lumbar puncture needle is passed into the sub-arachnoid space through the 3rd or 4th lumbar interspace. 5 c.c. of the c.s.f. is removed and 5 c.c. of air is injected into the spinal canal slowly, taking 5 minutes. This procedure is repeated until the desired amount of fluid has been replaced by air.

Encephalography cannot be done in cases when the patient is having increased intracranial pressure or when he is having tumors in the posterior cranial fossa. This method is dangerous as removal of the c.s.f. results in the cerebellum herniating into the foramen magnum. Respiration may sometimes suddenly cease. The patient is immediately put in the Trendelenberg position and artificial respiration begun and if necessary, a ventricular puncture may have to be done to save the patient.

Post-operatively, the patient is placed in bed with the head elevated about 6". B.P. recorded every half-hour for the next 6 to 8 hours. Pulse rate and respiratory rate also should be noted every hour. The diet should consist of fluids for the first 24—48 hours These patients have severe headache until the gas is absorbed, and they usually complain of hearing splashing noises when the head is moved. This is due to the presence of gas and fluid in the head. After the headache has disappeared, the patient can sit up or move about.

Ventriculography: This is a procedure by which gas is introduced into the cerebral ventricles. In cases of space occupying lesions, most surgeons employ this procedure for demonstrating the ventricles. The preparation is the same as that of encephalography. The head of the patient must be completely shaved. Under local anaesthesia, Trephine openings are made and dura is opened and cannula introduced into each ventricle. As the fluid is coming out through one

cannula, air enters through the other and just before removing the cannula, 10 c.c. of air is injected. All the fluid should never be removed as it produces severe shock.

The post-operative care is to keep the patient in bed with the head elevated to about 12". Pulse rate, temperature respiratory rate and B.P. should be recorded very carefully. Severe head ache may occur and may last for about 24 to 48 hours. If a tumour is revealed by this method, operation is immediately done.

Arteriogram: Cerebral arteriogram is done to visualise the arterial system of the brain. This is helpful in the diagnosis and localisation of intracranial vascular lesions such as aneurysm, angiomas, arterio-venous aneurysms, subdural haematoma and intracranial tumours by their vascular

FIG 81 Diagram showing a carotid angiogram

patterns. This procedure can be done either by exposing the carotid artery or by using the closed method and introducing

Diodrast into the vessel. When satisfactory films are secured the needle is removed from the artery and pressure is applied over the point of puncture for a few minutes to stop any bleeding.

Post-operative management consists in observing the patient for any haematoma in the neck. Rest in bed for 24 hours is advised, and the patient can carry on his normal work the following day.

Gynaecology: The attitude of different gynaecologists to the procedure of uterosalpingography varies widely. In some clinics, it is regarded as an indispensable procedure in the investigation of many gynaecological disorders. In other places, it is done for investigation of sterility. This procedure should be performed jointly by the gynaecologist and radiologist.

Lipiodol is injected through a cannula passed through the cervical canal. When the opaque medium is injected, the gynaecologist should occlude the cervical canal so that the fluid may fill the uterine cavity and pass through the tubes. As soon as "spill" of the oil is noted in the peritoneal cavity by the radiologist, the injection is stopped. X-Ray pictures are taken and then the instruments removed and the vagina cleansed. This procedure is useful in the investigation of uterine haemorrhage, pelvic tumours and sterility. It is contraindicated if the patient has got fever, acute infection of the genital tract, pulmonary or cardio-vascular disease and pregnancy.

If hystero-salpingography is done in cases of acute infection, the patient is likely to get pelvic peritonitis or septicaemia. In some cases, if the oil is injected at great pressure, tubal rupture is likely to occur. Hystero-salpingography should not be done during the menstrual period. At least 8 days must elapse before the procedure is undertaken.

Sialogram: Plain X-Rays will show the presence or absence of calculi in the salivary glands. Sialography may be defined as the radiographic demonstration of the salivary

ducts and alveoli by the injection of a radio opaque dye. Lipiodol is used to bring out the salivary ducts and alveoli.

FIG 82. Diagram showing a calculus in the submaxillary salivary gland.

Preparation of the patient. The patient has a mouth wash with an antiseptic before the injection. The cannula and tube must be filled with lipiodol before insertion into the duct. About ½ c c. is injected slowly and it may take about a minute to fill the gland satisfactorily. Pain in the gland is an index that enough has been given. After the injection has been completed, the patient must keep the cannula in the mouth by closing the lips gently. After an X-Ray has been taken, and if it is found that the injection is not sufficient, a little more of the dye can be injected again to fill the ducts and alveoli. The radiograms should be taken as expeditiously as possible before the dye passes into the minute alveoli as it may blur or obscure outlines of the fine ducts.

Sialograms may be of help to find out whether:

1. the tumours in the region of these glands are salivary in origin;

2. in cases of external fistula, the relation of these fistula to the ducts of glands could be demonstrated.

Radiation Therapy

The preparation of these patients before they are given a course of radio therapy is as follows: —

1. Complete examination of the blood and urine.
2. A check up of the pulmonary, cardiovascular and renal systems.
3. X-Ray examination of the lungs and skeleton to show the extent of the malignant growth or metastasis.
4. V.D.R.L. test should be done.

In cases where radium needles are implanted for cancer of the tongue, lips or mouth, a careful attention to oral hygiene, and removal of all carious teeth and sepsis, before any radium therapy is administered. If the patient is having very bad teeth dental extraction is done and mouth washes advised after every feed. During the course of the therapy he is likely to develop radiation sickness.

Irradiation sickness is the term applied to the syndrome developing during or after the course of therapeutic X-Ray administration. The patient is likely to have anorexia, nausea, vomiting, weakness, exhaustion, lassitude and in some cases prostration. This symptom complex is more likely to occur when it is given over the upper abdomen.

Treatment:

1 Pyridoxin 50 to 100 mgms. I.V. once or twice daily.

2. Multivitamin tablets orally.

3. Sedation by the use of drugs like phenobarbitone or pentobarbital when the patient complains of loss of sleep.

4. Dramamine 100 mgms. 20 to 60 minutes before therapy and repeated three hours after therapy.

5. Liver extract and vitamin B_{12} are given on alternate days I.M.

6 Any deficiency in the electrolyte or fluid balance must be corrected.

7. Transfusion of blood if anaemia is present.

8. General health improved by giving nourishing diet which must not be less than 2000 calories.

When irradiation is applied to the tongue or mouth, the mucous membrane undergoes certain changes, and the patient complains of severe rawness and inability to swallow any food. Mouth washes using glyco-thymolin or dettol or warm saline are given after every feed. Anaesthetic lozenges are prescribed for patients who complain of severe pain in the mouth or throat. If a patient is not able to take any food, a Ryle's tube is passed through the nose and an intra-gastric milk drip is started

In some patients a violent skin reaction may follow after irradiation No dressings are applied over the skin except dusting powder. If there is any exudation calamine lotion or gentian violet 1% or tanna wax jelly is applied over the irradiation area.

Appendix I

CHEMO-THERAPEUTIC DRUGS

The sulphonamide drugs and the antibiotics, Penicillin, Streptomycin, Aureomycin, Chloromycetin, Terramycin, Bacitracin, Polymyxin, Neomycin and Erythromycin are powerful agents affecting a wide variety of pathogenic organisms. Some of these drugs are bacteriostatic, others are bacteriocidal in their action. These drugs have to be used either singly or in combination to bring about the desired result. They are very effective in their anti-microbial action but if the causative organism is known, then the appropriate drug can be used with spectacular results. Indiscriminate use of chemotherapeutic drugs or antibiotics is wasteful and may cause serious toxic effects The sulfonamide drugs are potentially dangerous and should be reserved for certain specific infections. Some of the antibiotics can be administered together, e g., Penicillin and Streptomycin because of their synergistic activity in infections. On the other hand, combinations like Penicillin and Chloromycetin are not given because of their antagonistic action.

Sulphonamides

Sulphonamides, first discovered by Domagk in 1935, became very popular in controlling coccal and bacterial infections. With advancing research, a variety of newer Sulpha preparations came into the field. Sulphapyridine was found to be of great value in Pneumonia but, because of its toxic effects, it was replaced by Sulphathiazole and Sulphadiazine. Still later, Sulphamezathine came into the field and because of its low toxicity, it was used as a routine for systemic and urinary infections. As this drug was found to be readily soluble in the urine and did not form any crystals in the tubules of the kidney it was a great advance over the previous preparations. Sulphamerazine was found to be good

because of its rapid absorption from the intestines and due to its being slowly excreted, smaller doses of this drug was prescribed. Phthalylsulphathiazole and Sulphasuccidine are found to be very useful in debacterialising the colon.

The dosage of these sulphonamides depends upon—

(a) the nature of organism and the intensity of infection.

(b) Rate of absorption and excretion of these drugs.

(Sulphamerazine is slowly excreted and therefore fourth-hourly regime may not be necessary).

(c) The site of infection. Sulphaguanidine and Sulphasuccidine drugs are not absorbed and hence are useful for clearing infections in the colon and intestines.

Sulphamezathine, Sulphadiazine, Sulphamerazine and Sulphathiazole are useful in urinary infections. A combination of Sulphathiazole, Sulphadiazine and Sulphamerazine supplied by May & Baker as Sulphatriad has been found to be useful for controlling infections in the genito-urinary tract.

Dosage and Methods of Administration

Initial dose of 2 to 4 grams of Sulphadiazine or a mixture of Sulphonamides, followed by a maintenance dose of 0·5 to 1 gram every four or 6 hours.

In alimentary infections, the dosage will be 0 11 gram per Kilogram body weight daily, divided into four doses, followed by ·055 gram per Kilogram every 4 hours.

When these Sulpha drugs are given, the patient must be given plenty of fluids, at least 5 to [illegible] pints in 24 hours, so that the urinary output may be about 40 to 50 ounces in 24 hours. He is also given an alkaline mixture by mouth so that the urine is kept alkaline during the whole period of Sulphonamide administration Fluid in-take and out-put charts must be maintained when Sulphonamide therapy is

started. Some of the toxic reactions noticed during Sulphonamide therapy are nausea, vomiting, headache, fever, rash, granulo-cytopenia, aplastic anaemia, severe haematuria, oliguria and anuria. If patient is sensitive, Sulphonamide administration must be stopped. During therapy, Haemoglobin determination and White Blood Cell count is done every other day—the urine is examined to find out if it is alkaline. If the granulocyte count is less than 5000, Sulphonamide therapy is stopped. If the P.H. of urine is less than 7, more alkalies are given and the urine output is closely watched to ascertain if crystaluria occurs. Sulphonamides have to be used with great caution if the patient has renal insufficiency, liver damage or heart failure.

Dosage of Sulpha drugs in children

1 gr. *Sulphadiazine* per Kilogram body weight per day given in divided doses every 4 or 6 hours.

Sulphasuccidine 150 mgs per pound body weight per day, 4 times a day.

Para Amino Salicylic Acid (PAS) and its sodium salt have been found to be very effective against tubercular infection. Tubercle bacilli resistant to Streptomycin may be susceptible to PAS and vice versa. PAS is absorbed readily from the gastro-intestinal tract. It may be administered orally or intravenously and in some cases, applied topically.

Dosage 2 to 3 grams every 6 hours by mouth.

Intravenous 15 grams in 3% solution given in 2 doses, 4 hours apart, 5 milligrams of Heparin should be added to each litre.

Toxicity: Nausea, vomiting, diarrhoea, haematuria, and hypo-prothrombineuria may occur. Gastro-intestinal symptoms may be avoided by parenteral therapy.

Isonicotinic acid Hydrazide (INH). This compound is readily absorbed from the upper gut and is found to possess bacteriostatic effect on tuberculous bacilli INH is readily

absorbed and distributed throughout the body fluids including the cerebro-spinal route.

Dosage: [redacted] to [redacted] milligrams per Kilogram body weight per day given in divided doses twice or thrice in 24 hours orally.

Toxicity may occur due to prolonged administration and the patient may complain of constipation, difficulty in micturition, euphoria, insomnia and twitching due to central stimulation and occasionally dizziness and eosinophilia may occur.

Antibiotics

Penicillin

Penicillin is the name applied to the antibiotic substance produced by a mould of the genus Penicillin, first observed by Fleming and later elaborated by Florey and others. Penicillin is effective against staphylococcus, streptococcus pyogenes and viridans, pneumococcus, gonococcus, meningococcus, actinomyces, anthrax, diphtheria, clostridia of tetanus, gas gangrene, spirochaetes of relapsing fever, syphillis, yaws and Vincent's angina.

Penicillin in water solution is rapidly absorbed when administered intravenously or intramuscularly and somewhat more slowly absorbed after being subcutaneously injected. The peak concentration in the blood is reached immediately after intravenous injection and one hour after intramuscular injection. Blood levels persist after 3 hours when larger doses of Penicillin are given.

Penicillin procaine suspensions produce serum concentrations within 12 hours which lasts for more than 72 hours when combined with 2% aluminium monostearate. Penicillin is absorbed readily from the small intestine when given by mouth and the pills must be coated to prevent the destructive effect of the gastric juices. Very large doses of Penicillin must be given when administered by mouth to produce satisfactory blood level concentration.

The following preparations of Penicillin are available:

1. Crystalline Penicillin (Sodium and Potassium salts).
2. Procaine Penicillin.
3. Procaine Penicillin in oil with 2% aluminium monostearate.
4. Procaine Penicillin in aqueous suspension.
5. Penicillin tablets.
6. Penicillin powder for insufflation.
7. Penicillin ointment (external and opthalmic).
8 Penicillin G—Diethyl Amino Ethyl Ester Hydriodide (Estopen).

Dosage: The dose and duration of administration vary with the infection. In many infections, good results may be obtained by administration of 500,000 units every 12 hours intramuscularly When Procaine Penicillin is administered 300,000 to 600,000 units are given intramuscularly every 24 hours In very severe, acute infections, Penicillin in aqueous solution in doses ranging from 500,000 to 1,000,000 units is given intramuscularly every 3 hours. In some cases, continuous intravenous administration of Penicillin is prescribed. Many million units dissolved in 1000 c.c. of normal saline or 5% glucose in water may be administered by the drip method Thrombophlebitis is a complication but may be avoided by changing the vein every 12 hours.

Oral therapy

Penicillin may be given orally in very mild infections.

Dosage: 100,000 units every 3 hours.

Topical

Penicillin powder or solution may be inhaled through special inhalers or nebulizers. They are effective in their treatment of Bronchiectasis, chronic bronchitis and before lung surgery.

Sterilisation of the respiratory tract can be done by this method.

Intra-thecal

Intra-thecal administration may be done once a day, using 10,000 units of Penicillin dissolved in 10 c.c. of normal saline. When this method is adopted, Penicillin should also be given intramuscularly to produce the desired effects in cases of Meningitis.

Intra-pleural and Intra-articular

Intra-pleural and intra-articular administration of Penicillin may be done daily if the organism is susceptible to it in doses of 10,000 to 200,000 units.

Penicillin Troches are useful in cases of pharyngitis and tonsillitis. The troche is kept in the mouth till it is completely absorbed.

Penicillin ointment is useful in cases of wounds and burns

Toxicity. Toxic effects are extremely few. Sometimes, patients may develop fever and rashes. Very rarely, severe allergy may occur resulting in death of the patient. Patients known to be sensitive to Penicillin should be desensitised or, better still, one of the other antibiotics should be administered

Streptomycin

Streptomycin is prepared from the cultural products of streptomyces griseus. Streptomycin is very effective against Gram-negative and Gram-positive organisms. This particular drug has been one of choice in tuberculous infections.

The indications for streptomycin are almost entirely limited to infections due to Gram-negative organisms and tuberculosis. Most tubercular bacilli become resistant within 3 or 4 months although the simultaneous use of PAS may delay this event. Streptomycin is both bacteriostatic and bactericidal and should be administered intramuscularly.

The dosage of the drug varies from 1 to 5 grams daily in divided doses every 4 or 6 hours and continued for 90 to 120 days in cases of miliary, pulmonary and meningeal tuberculosis.

In urinary infections, 1 to 2 grams may be given once or twice a day for 7 to 10 days. Before bowel surgery, Streptomycin can be administered by mouth and although it is not absorbed, from the gastro-intestinal tract, it exerts a bacterio-static activity in the lumen of the bowel.

Dosage in children varies from 25 to 50 milligram per Kilogram body weight per day up to 1 gram a day, given intramuscularly in 2 divided doses.

The toxic effects of Streptomycin may be due to its impurities. The nature of the reactions noticed are:

1. Disturbed vestibular function and sometimes deafness.
2. Allergic reactions.
3. Drug rashes.
4. Eosinophilia and Leucopenia without granulo-cytopenia.

The use of combined Streptomycin and Dihydrostreptomycin in equal parts reduces the incidence of deafness and vestibular damage.

Aureomycin or Chlortetracycline

Aureomycin or Chlortetracycline is prepared from streptomyces aurefaciens. This drug can be used as an *alternate* to Penicillin or Streptomycin in most bacterial infections. It is a broad-spectrum antibiotic and therefore very effective in Gram-positive and Gram-negative organisms. It is absorbed slowly from the gastro-intestinal tract and the high blood level concentration occurs after prolonged administration. In cases of very acute infections like general peritonitis, it can be administered intravenously.

Dosage: 250 milligrams to 500 milligrams may be given orally every 4 or 6 hours in acute infections. When given

intravenously, 500 milligrams may be given by the drip method every 12 hours. When administered intramuscularly, 100 milligrams are given every 4 hours.

Toxicity. Nausea, vomiting and loss of appetite are the usual complications that are observed. Sometimes, the patients develop stomatitis, rashes and diarrhoea.

Patients getting Aureomycin must be given B Complex injections or tablets to correct the Vitamin deficiency that occurs.

Achromycin

Achromycin or Tetracycline resembles in its properties Chlortetracycline. This drug is also a broad-spectrum antibiotic and more stable in solution and diffuses more readily into the cerebro-spinal fluid.

Dosage: 200 milligrams to 500 milligrams every 4 or 6 hours.

Intravenous: 500 to 1000 milligrams every 12 hours.

Intramuscular: 100 milligrams every 6 to 8 hours.

Toxicity is similar to Aureomycin.

Terramycin or Oxytetracycline

Terramycin is derived from Streptomyces Rimosus. This is also a broad spectrum antibiotic similar in its activity to that of Aureomycin or Achromycin.

Dosage and route of administration is similar to that of Aureomycin or Achromycin.

Toxic manifestations are similar to that mentioned under Aureomycin. In addition, Hepatitis may occur after prolonged administration.

Chloromycetin

Chloramphenicol or Chloromycetin is produced synthetically and has a wide range of activity. It is more effective

in typhoid fever. This drug is rapidly absorbed from the gastro-intestinal tract and reaches the maximum level of blood concentration in 2 hours.

Dosage: Chloramphenicol is administered in capsules, 2 grams initially followed by 0·5 gram every 4 or 6 hours.

For adults, 500 milligrams are given every 6 hours. In children, the dosage of Chloramphenicol is 25 to 50 milligrams per Kilogram body weight per day. When the drug is given intravenously, 25 to 100 milligrams per Kilogram body weight per day is given in divided doses every 6 hours.

Toxicity: Toxic reactions are nausea, vomiting, diarrhoea, granulocytopenia and aplastic anaemia and hence the drug should be given only when indicated.

Polymyxin

Polymyxin, derived from bacillus polymyxia and related organisms, is rapidly absorbed when given intramuscularly and when given by mouth it is not absorbed but exerts its principal activity in the lumen of the bowel. It is indicated only in severe systemic infections due to Gram-negative organisms particularly Pseudomonas Aeroginosa. The intramuscular dose is 1·5 to 2·5 milligrams per Kilogram body weight every 24 hours.

Toxic reactions occur when higher dosage is prescribed. Drowsiness, Diplopia, Ataxia and Rashes are observed.

Bacitracin

Bacitracin is derived from the growth product of bacillus subtilis. The antibacterial activity resembles that of Penicillin and is useful against Gram-positive cocci and spirochaetes. Bacitracin is principally used topically for local infections. It may also be used in cases of amoebiasis. Bacitracin may be used orally in such conditions.

Dosage: Topical. Ointments or solutions for pyogenic infections of the skin.

Oral: 50,000 to 100,000 units for 10 or 15 days.

Intramuscular: 20,000 to 80,000 units daily for 7 days.

Toxicity. Albuminuria has been noted after parenteral therapy.

Neomycin

Neomycin is derived from Streptomyces Fradiae.

Neomycin is very effective against Gram positive and Gram negative organisms. It is also effective against Bacillus Proteus, Pseudomonas, Aeroginosa and Tubercle Bacilli.

Neomycin is poorly absorbed on oral administration but readily absorbed after intramuscular injection. When given orally, it exerts its activity in the lumen of the bowel.

Toxicity: Renal damage has been noticed as well as auditory damage following parenteral therapy.

Dosage: *Topical:* Ointments may be used locally.
Oral: 50,000 units every 6 hours.
Intra-muscular: 200,000 units daily.

Erythromycin

Erythromycin is obtained from a strain of Streptomyces Erythreus. Its action may be bactericidal or bacteriostatic and it is active against Gram-positive and Gram-negative organisms. It has been found to be effective against viruses of Lympho-pathia venereum Erythromycin, sold under the name of Ilotycin, may be used in infections as an alternative to Penicillin and other antibiotics. It can be administered orally in doses of 200 to 300 milligrams every 4 to ■ hours.

In children, the dosage should be 10 to 15 milligrams per Kilogram body weight per day, administered every 6 or 8 hours.

Toxic reactions noticed after the administration of this drug vary from a mild gastro-intestinal irritation to severe nausea, vomiting, diarrhoea and abdominal cramps.

Carbomycin

Carbomycin is ■ medium spectrum antibiotic, less potent, less rapid in action and less satisfactory than Penicillin or

Erythromycin. It exerts its therapeutic effect on infections of the biliary tract and over E. Histolytica infections. Carbomycin is usually administered orally in doses of 500 milligrams every 6 hours.

Chemo-therapeutic agents used in the treatment of malignant diseases

The drugs that have been used within the last few years for malignant diseases have been more in the nature of palliation than curative. These drugs can never take the place of surgery or radium therapy.

Nitrogen Mustard seems to exert a specific action on the nucleii of growing or rapidly multiplying cells. It has been used in cases of chronic Myeloid Leukaemia, Hodgkins Disease, Lymphosarcoma and in cancer of the lung. In some cases, Nitrogen Mustard combined with Radium therapy has been a useful method for palliation.

Dosage: 0·1 milligram per Kilogram bodyweight repeated every day or on alternate days until a course of six injections are given. Some recommend a smaller dosage of 4 or 5 milligrams every day.

The chief complications, when this form of therapy is adopted, are: headache, nausea, anorexia, aplastic anaemia, leucopenia and thrombocytopenia.

If the w.b c. count is low, it is safer not to use this drug.

TEM-Triethylene Melamine

TEM—This drug can be given orally in tablets along with Soda Bicarb to prevent its being destroyed by the acidity of the stomach.

The dose is 0·1 to 0·2 mg. per Kilogram body weight orally. It has been found to be useful in the treatment of Hodgkins disease. This drug is repeated every day till a total dosage of 20 to 30 mg is reached in a month.

The toxic reactions are similar to Nitrogen Mustard but the advantage is that it could be given orally.

APPENDIX II

SURGICAL THERAPY IN THE DIABETIC

Prior to the discovery of insulin, the dangers inherent in surgical therapy in the diabetic were well recognised. The use of insulin was a great advance in the treatment of such cases, but it was realised that its prolonged use parenterally and possible fluctuations in the blood sugar level were factors which mitigated against its effective use as a routine measure in all cases. Attempts were therefore made to find out a drug of synthetic origin which would be fit for oral medication and would control the diabetes.

The most outstanding contribution in this field within the last three years has been the discovery of a drug known as 'Carbutamide' BZ 55 which is a sulphonamide derivative; (also known as Invenol or Nadison). Carbutamide or Invenol, being a sulpha derivative, has certain toxic potentialities. Hence, after further trials, a non-sulphonamide derivative with the absence of p-amino (NH_2) group has been discovered known as Tolbutamide (Rastinon) which has no toxic effects and is therefore the drug of choice for the diabetic for oral administration

Clinical and experimental trials have however shown that a certain amount of endogenous (or exogenous) insulin in the body is necessary for Tolbutamide to act. This explains the marked effectiveness and suitability of the drug in mild cases and its failure in cases of juvenile diabetics who are almost devoid of any endogenous insulin. It would thus appear that for the successful action of Tolbutamide, the most suitable cases are those where there is diminished insulin production by the body When the patient is having such surgical conditions like boils, furuncles or infections, Tolbutamide has a place in controlling the blood sugar levels and is a useful aid in therapy.

Slight to severe degrees of ketosis not uncommonly occur in surgical cases with diabetes with or without infection. The ketosis may be related to the diabetic condition or it may be a purely non-diabetic ketosis due to partial starvation, dehydration and hyperpnoea. The Tolbutamide cannot correct the ketosis quickly and insulin therapy may have to be resorted to. Tolbutamide has no place in the treatment of diabetic ketosis and coma.

The oral administration of Tolbutamide may not be possible in some surgical conditions. Since a quicker and prompt and accurate control of blood sugar levels would be ideal in the surgical diabetic during the acute stage for proper healing of the wound and recovery of the tissues, it would be better to depend upon the physiological substance, Insulin, rather than on Tolbutamide which is a chemotherapeutic drug. In a few cases, however, Tolbutamide may with advantage be combined with Insulin therapy, as the dosage of Insulin required will be much less than with Insulin therapy alone. The objection to the use of large doses of Insulin lies in the fact that sharp changes in the sugar levels may result in marked hypo-glycaemic levels leading to changes in the autonomic system due to stimulation of the hypothalamic centre in a few cases and in a few others to precipitation of coronary attacks or cerebral thrombosis in susceptible individuals.

In selected cases of mild diabetes who have been on Tolbutamide therapy, there is no reason why minor surgical aseptic operations should not be undertaken. These cases respond well unless there is a resulting infection. In severe diabetics, the degree of hyperglycaemia may be reduced somewhat by Tolbutamide, but the control to near normal limits is impossible without the use of Insulin. In emergencies, Insulin is still the drug of choice. Thus, the present trend is to control the diabetes by the oral administration of Tolbutamide if the infection is mild as in cases of boils, furuncles, abscesses and urinary infections. If the infection however is severe and the diabetes is not controlled or if there be

marked ketosis or tendency to coma, Insulin therapy should be instituted without delay. Finally, it must not be forgotten that there are a few individuals who are hypersensitive to Insulin administration and who exhibit alarming anaphylactic reactions such as syncopal attacks and marked skin reactions after Insulin. For such individuals who have to undergo surgery, Tolbutamide is the only form of therapy available.

Conclusion: Tolbutamide therapy is to be recommended for mild surgical complications like boils, furuncles, abscesses, urinary infections and for associated diseases like tuberculosis. If the blood sugar has not been controlled, it is safer to switch on to Insulin therapy. In cases of ketosis or threatening coma, it is necessary to start with Insulin therapy and when the condition is controlled, Tolbutamide therapy can be started for reducing the blood sugar level in selected cases of diabetes.

APPENDIX III

HORMONE THERAPY FOR CANCER

Extensive trials with Hormones have shown that certain types of cancers could be controlled. The diseases on which hormone therapy has been tried are: Malignant diseases of the Breast, Prostate, Ovary, Lymphatic and Haemopoietic systems Even after extensive trials, it was found that hormone therapy was beneficial only in two conditions, Cancer of the Breast and Prostate. The rationale of hormone therapy is not very clear and the treatment is purely on empirical grounds.

Cancer of the Breast

Surgery and irradiation are still the methods of choice for early and advanced cases.

(a) When the disease is advanced and radical surgery is not possible, either irradiation or a combination of x-ray therapy and hormone therapy have been used to control the disease.

(b) In cases where radical surgery has been done and the patient has developed secondaries, hormone therapy is given to bring about a certain degree of palliation.

As cancer of the breast is considered to be hormone dependent, oophorectomy or irradiation of the ovaries is done in pre-menopausal women to suppress the ovarian function By this method, the patients rapidly improve. When the patient was not benefitted by castration, it was felt that breast cancer was non-oestrogen dependent. In those cases, it was found that the adrenal and pituitary glands increased in size and it was suggested that hypophysectomy and adrenalectomy may bring about a further remission in the disease.

Oestrogenic hormone is given in all cases of advanced cancer with metastases in post-menopausal women. Stilboes-

trol in doses of 100 mg. daily is given to these patients till a favourable response is achieved, and then the patients are put on a maintenance dose of 50 mg daily for the rest of their lives Recently, some advocate an interrupted line of treatment, i.e., once a regression is attained, the hormone is discontinued and is resumed when re-activation is noted.

In a small proportion of cases of cancer of the breast occurring in younger women, androgens are given. Testosterone Propinate 100 mg by intramuscular injections, thrice a week is given Occasionally, Methyl Testosterone may be prescribed in linguettes which are allowed to dissolve under the tongue in doses of 100 mgs. daily. Secondary deposits clear up and the severe pain may also disappear.

Radiological examination may show re-calcification of the secondary deposits. Usually, a favourable response is obtained by this therapy and the improvement noted plays an important part in helping the patient to get over the period of depression.

If there is no response with androgen therapy, the question arises whether oestrogens may be given. This change in therapy may not do her any good but it is certainly not going to do any harm

Adrenalectomy in Cancer of the Breast

Patients, who have shown improvement after oophorectomy, are likely to show better response after total bilateral adrenalectomy The removal of the adrenal gland results in removing all the hormone which has been the stimulant for tumour growth. These patients have to live on Cortisone, 50 to 75 mgs. daily, for the rest of their lives Kennedy in 1954 employed Hypophysectomy as a palliative measure in advanced breast cancer.

Removal of the pituitary gland causes a secondary atrophy of the adrenal glands and a regression of the secondary deposits occurs.

Disappearance of pulmonary lesions, glandular deposits, skin lesions and skin nodules have occurred after this operation. These patients, after hypophysectomy, must be kept on Cortisone therapy.

The decision to do hypophysectomy or adrenalectomy depends upon whether the breast cancer is hormone dependent or not. One method of finding this out is to study the urinary calcium levels after giving Stilboestrol for three days in breast cancers If hypercalcinuria occurs, it is claimed that it is hormone dependent and is a good indication for adrenalectomy.

Cancer of the prostate

In 1941, Huggins demonstrated that castration was of value in the treatment of certain cases of carcinoma of the prostate. By removal of this source of androgens, the patient showed clinical improvement. This led to the theory that cancer of the prostate can also be controlled by hormones. Striking improvement was noticed when the patient had bilateral orchidectomy. The clinical response was even greater when oestrogenic hormone was administered: the patients had complete relief of pain, appetite improved, haematuria disappeared and the secondary deposits in the bone underwent re-ossification.

Biochemical investigations of serum acid phosphatase showed a reduction which was one method of assessing the response to this form of therapy.

Dosage: Stillboestrol, 50 mgs. daily, until a favourable response occurs, then 20 mgs daily for the rest of his life.

There are two schools of thought as far as the treatment of cancer of the prostate is concerned One school is of the opinion that hormone should be given first and orchidectomy done as a final method of attack of the disease. Other workers are of opinion that oestrogen therapy and orchidectomy should be advocated as a routine in every case.

As carcinoma of the prostate is dependent upon the presence of circulating androgens for its growth, bilateral adrenalectomy has been advocated for advanced cases. The improvement noted has not been so striking as in breast cancer. The other operation of Hypophysectomy is being done and is found to be more effective than bilateral adrenalectomy in bringing about relief of pain, disappearance of soft tissue metastases and calcification of secondary deposits.

Cortisone therapy for Cancer

A C T H. and Cortisone are being given for cases of Hodgkin's disease, leukaemias, multiple myeloma and lymphosarcomas. Some of the patients have responded favourably as shown by an increased sense of well-being and decrease of pain. These hormones seem to be more in the form of palliation in the terminal stages of the disease.

Appendix IV

RADIO ISOTOPES

One of the latest developments in the treatment of Endocrine disorders is the use of radio-active iodine for hyperthyroidism. Radio-active isotopes should be tools for the use of the clinician in diagnosis and treatment. They are used in the treatment of certain diseases by surgeons and radiologists. The word 'Isotope' was derived from two Greek words, 'Isos' and 'Topos' meaning the "same place", i.e., the same place in the periodic table. Therefore Isotopes are atoms of a given element which differ from each other in the number of neutrons in the nucleus. Thus the Isotope of an element will have a numerical superscript employed after the chemical symbol to designate the total number of protons and neutrons in the nucleus.

Some Isotopes were found to be radio-active. Three types of radiation were first found to be emitted from the nucleus—these were Alpha, Beta and Gamma. The amount of radio-activity is measured and this is referred to as a curie which is a unit of radio-activity defined in terms of the number of atoms of a given substance which disintegrate in one second, thus, one curie equals $3 \cdot 7 \times 10^{10}$ disintegrations per second. These radio-active Isotopes decay at a rate, specific for that particular Isotope. The time required for a 50% of the Radio Isotope to decay is called the half life, e.g., Iodine,^{131} half life is 8 days. Radio Isotope P^{32}, half life is 14 days. Half life is a constant figure for each Isotope and it is not affected by temperature or any other factor.

The effects of these radiations are that in cases of new growths, the tumour cells which are actively dividing are killed, whilst the normal tissue cells survive. If the cells are over-active, their function is restrained. Using this principle, radio-active Iodine was used in cases of hyper-thyroidism.

Radio Active Iodine (I^{131})

I^{131}. This is used in cases of:

1. Hyper-thyroidism;
2. Cancer of the thyroid;
3. As test for thyroid function.

Hyper-thyroidism

Thyro-toxicosis has been treated by antithyroid drugs and surgery. When antithyroid drugs are used, the hyper-function of the thyroid is controlled but to cure the disease, surgery is indicated. When the patient has complications like auricular fibrillation or congestive heart failure, operation is contra-indicated because of the high mortality. In 1942, radio-active iodine was first used in Hyperthyroidism. Compared to surgery, the advantages of this new wonder drug are many:—

1. There is no risk either of paralysis of the recurrent laryngeal nerve or of tetany.
2. No scar on the neck.
3. Relief from toxicity due to Hyperthyroidism is very great.
4. Absence of any toxicity when I^{131} is administered.
5. The drug can be taken by mouth.
6. Compared to X-ray therapy, treatment with radio-active iodine has a more steady and sustained effect.
7. Skin not affected.
8. Other organs like the pituitary, parathyroid, etc. are not affected because the Beta radiations emitted by the Isotope do not penetrate more than 2·2 mm.
9. Radio-active Iodine treatment has never been observed to cause malignant degeneration of the thyroid

There are certain contra-indications in the use of this drug:

(i) I^{131} is strictly contra-indicated in pregnant patients.

(ii) If cardiac disease has advanced to a severe degree, I^{131} is contra-indicated because of an increased hazard of death from the metabolic effects of irradiation thyroiditis.

(iii) When the goiter is very large, I^{131} therapy will not be of any use to destroy the condition, as very large doses are necessary and hence it is impracticable.

(iv) Another contra-indication is that some of the nodules in the colloid goiter might be malignant and may be missed when this therapy is used and may become inoperable at a later stage.

The indications are:—

1. Patients with angina pectoris or congestive failure remain disabled and in great discomfort despite all therapeutic measures. These are the patients who can be salvaged with radio-active iodine.
2. Patients who have had a relapse following surgical thyroidectomy.
3. Patients past the age of 50 and who have ex-ophthalmic goiter.
4. Patients refusing surgery or where surgery is contra-indicated.

Dosage: The hyperthyroid patient can be cured with one dose of I^{131} or with numerous small doses. The average single dose necessary for a patient with Grave's disease is 7 to 10 millicuries. Depending upon the size of the gland and on the degree of toxicity, the dosage is increased or decreased by 1 to 3 millicuries.

The average total dose of I^{131} necessary to relieve patients with toxic nodular goiter is about 30 to 40 millicuries. Generally it is advisable to administer only half the total dosage of 10 millicuries at first and after a month or two months' rest, to give the rest It is unduly dangerous to try to make these patients well with one large dose of I^{131}.

The unpleasant effects after this form of therapy are:—

1. Irradiation thyroiditis;
2. Worsening of thyrotoxicosis;

3. Hyperthyroidism;
4. Persistent goiter.

I^{131} tests of thyroid function

Radio-active iodine tests of thyroid function generally depend upon measurement of I^{131}, excretion in the urine, uptake in the thyroid level in the blood or a combination of these measurements.

In cases of thyrotoxicosis, the diagnosis can be easily made by clinical examination. Basal metabolic rate and serum cholesterol determinations certainly help the clinician in diagnosing the extent of toxicity of this condition. But when the patient has heart or lung disease, the above determinations are not accurate; for this reason, radio iodine tracer tests and serum-protein-bound iodine determinations are done on these patients when the diagnosis of thyro-toxicosis is in doubt.

The uptake of I^{131} depends upon the activity of the thyroid gland. When the gland is hyperactive, the concentration of I^{131} is faster. With a Geiger or a scintillation counter tube over the patient's thyroid gland, one can estimate how many radio-active atoms of iodine have been picked up by the thyroid. By this method, the amount of I^{131} present in the thyroid gland can be determined in terms of the tracer dose administered. The dose of I^{131} is called a "tracer" because it has not enough number of iodine atoms or sufficient radio-activity to alter the activity of the thyroid gland In thyro-toxicosis, the thyroid takes up more than 40% of the tracer dose by 48 hours and the proportion taken up varies with the severity of the disease.

After the administration of the dose, the following tests are done:—

1. I^{131} uptake by thyroid in 24 hours;
2. Serum P.B.I. estimation;
3. The rate at which iodine is removed by thyroid and kidney and the fall of the P.B I.

Thus these are useful tests in the differential diagnosis of thyroid disease.

Radio iodine in Cancer of thyroid

Radio active Iodine, I^{131}, is not the treatment of choice for carcinoma of the thyroid gland. Radical surgery is the only hope for these cases. Total thyroidectomy should be attempted even in the patients with anaplastic thyroid carcinoma, the reason being that the patient may not get complications like compressions of the trachea, oesophagus and large vessels in the neck due to invasion of the growth before radio-active iodine attempts to destroy the metastases. One important reason for this radical surgery before I^{131} is given is that, if the patient has metastases as well as involvement of a portion of the thyroid gland, then the therapy becomes inadequate. Thus if the patient has only metastases, then the maximum effect of I^{131} therapy will be felt by the secondary deposits.

The modern trend in the treatment of cancer of the thyroid is to do a total thyroidectomy with or without radical neck dissection followed by X-ray therapy If the growth is inoperable, X-ray therapy is the treatment of choice. When the surgeon has performed a total thyroidectomy and there are evidences of metastases, it would seem advisable to administer I^{131} to complete the job. Thus I^{131} has been used as a last resort by the surgeon to destroy metastases.

If a total thyroidectomy has not been done previously, then I^{131} uptake is distributed between the metastases and the thyroid gland and the patient does not benefit by this therapy. A very large dose is necessary to destroy a thyroid carcinoma This dose has to be split up and the patient watched during this therapy.

Toxicity

1. Irradiation sickness.

2. Depression of bone marrow function which may end in a drop in the R.B.C. count and aplastic anaemia.

3. Radiation parotitis and sub-maxillary gland involvement resulting in an alteration in the taste.

Conclusion

1. Smaller doses of less than 200 millicuries should be given at intervals of 2 or 3 mouths.
2. Blood picture, R.B.C., W.B.C. and platelet count should be done periodically.
3 When patient becomes edematous, thyroid extract should be given for a couple of months. This should be stopped at least six weeks before I^{131} therapy is started.
4. If platelet count drops, I^{131} therapy should be stopped.
5 X-ray therapy and I^{131} therapy should not be combined and the interval between the two must be at least 2 weeks.

Radio Active Phosphorus

It is used for treatment of polycythaemia vera, chronic lymphatic and myelogenous leukaemia, rodent ulcer and warts. In cases of polycythaemia, the patients are given an intravenous injection of radio-active phosphorus—the dosage being 3 to 5 millicuries. The whole treatment can be completed in a couple of days with simultaneous dextrose transfusion and venesection. Radio-active phosphorus does not accelerate destruction of circulating R.B.C's. Its main effect is on the bone marrow where it produces suppression of hematopoiesis

Radio Active Gold

Radio active gold has a half life of 2·69 days—it is used primarily for the intracavitary treatment of pleural and peritoneal effusions caused by neoplastic involvement of these surfaces. It is of little benefit for patients who are seriously ill. Radio active gold decreases fluid exudation and produces fibrosis of the tumour surface projecting into the cavity.

The dosage should be adjusted to the individual patient. The usual adult dose should be about 100 millicuries in cases

of pleural effusion and 160 millicuries when injected into the peritoneal cavity. The drug should be allowed to spread to all parts by adjusting the position of the patient. If it is localised in one spot as detected by the Geiger Muller counter, then the drug should be removed to prevent overdosage at that spot. Except for nausea, vomiting and diarrhoea when intraperitoneal administration is done, these patients get complete relief and freedom from repeated aspirations.

Carcinoma of the Prostate

Radio active gold therapy has been combined with excision of carcinoma of the prostate in cases where the growth has spread beyond the capsule. This drug is injected into the tissues after exposing the prostatic tumour through the suprapubic route. The prostatic tumour has been found to disappear in some cases following injection.

Radio-active gold has also been used to inject into the parametrium for cases of pelvic cancer. The results have not been very striking but improvement has been noted in a good number.

Radio Active Cobalt

Radio-active cobalt is a potent source of Gamma rays and a most suitable agent for the treatment of various neoplasms. One method of employing it for example is to stud the tumour tissue with needles of cobalt. Another method is to knead pellets of cobalt into a lump of synthetic substance which is then affixed to the appropriate surface, eg., mouth, throat, vagina, rectum.

Cobalt^{60} (Co^{60}) is also available in the form of beads and has been useful in the treatment of cancer of the oesophagus. In cases of cancer of the bladder, cobalt has been introduced through a rubber catheter having inflatable balloons of various sizes. These pellets remain inside the balloon and thus are useful in the treatment of bladder tumours.

Other Isotopes

The other Isotopes that are being used are:—

Tantalum for cases of papilloma of the bladder and epithelioma of the anus

Radio-active iodine and iron in determining the life span of the erythrocytes.

The other less commonly used radio isotopes are: radio-active copper used in the diagnosis of infections, nephrosis and Wilson's disease;

Isotopes like zinc, uranium, Yttrium, sulphur and silver are not used for routine diagnostic or therapeutic purposes to-day.

Thus radio-active isotopes have got a great future in the management of a large number of malignant tumours. They have not yet produced any dramatic cure but only time and patient research will reveal whether this form of therapy will become the treatment of choice for malignant diseases instead of surgery or radio therapy.

Appendix V

PHYSIOLOGICAL NORMALS

The table below shows the normal values of blood, urine and cerebro-spinal fluid constituents.

Blood differential count:—

R.B.C.	..	4·5 to 5 million per cu.mm.
Neutrophils	..	5,000 to 9,000 per cu.mm.
Lymphocytes	..	25 to 30%
Monocytes	..	4—8%
Eosinophils	..	0·5 to 3%
Basophils	..	0 to 1%
Reticulocytes	..	0·2%
Platelets	..	200,000 to 400,000 per cu.mm.
Erythrocyte sedimentation rate male	..	1 to 3 mm. per hour
(Westergren) female	..	3 to 7 mm. per hour
Haemoglobin male	..	14-16 Gm./100 cc.
female	..	12-16 Gm./100 cc.
Hematocrit male	..	45-47%
female	..	40-42%
Bleeding time	..	1-3 minutes
Coagulation time	..	2-10 minutes
Blood volume adults	..	3,000-7,000 cc.
male	..	45-85 cc. per Kg. body weight
female	..	65-100 cc. per Kg. body weight
Prothrombin time (Quick)	..	12-14 sec.
Capillary fragility test	..	10-15 petechiae per sq. in. on forearm after blood pressure cuff is filled to 90 mm. Hg. for 10 minutes

Blood gases:

Arterial blood	..	1. Oxygen content 16-20 vol. % 2. Oxygen capacity 95-100%
Venous blood	..	1. Oxygen content 11-17 vol. % 2. Oxygen capacity 35-100%

Normal blood chemistry values:

	Constituent	*Value/100 cc.*	*mEq./Liter*
Serum or Plasma	Sodium	310-340 mg.	136-145
	Chloride	350-375 mg.	100-106
	Total Chlorides	580-620 mg.	100-106
	Potassium	14-20 mg.	3·5-5·0
	Phosphorus	3-4·5 mg.	0·9-1·5 (mM)
	Magnesium	1-3 mg.	1-2
	Calcium, Total	9-11 mg.	4·5-5·5
	CO_2 Combining Power	55-75 Vol. %	24-28
	Cholesterol	150-240 mg.	
	Amylase	80-180 Units	
	Phosphatase, alkaline	2·0-4·5 Units (Bodansky)	
	Phosphatase, acid	0·5-2 Units (Bodansky)	
	Protein Bound Iodine	4-8 micrograms	
	Serum Albumin	4·5-5·5 Gm	Total:
	Serum Globulin	1·5-3·0 Gm.	6·0-8·0 Gm.
	Fibrinogen (plasma)	0·2-0·6 Gm.	per 100 cc.
	Albumin. Globulin Ratio	A 2 4·5 Gms/100 c.c.	
		G 1 2·5 Gms/100 c c.	
Blood	Glucose	80-120 mg. (Folin-Wu)	
	Total Non-Protein Nitrogen	15-35 mg/100 cc.	
	Urea Nitrogen	10-20 mg/100 cc	
	Uric Acid	3-6 mg/100 cc	
	Creatinine	1-2 mg/100 cc	

The constituents of urine are

Water	..	1000-1500 cc.
Total Gravity	..	55·0-70·0
Specific Gravity	..	1·002-1·040
pH	..	4·8-7·8
		Grams per 24 hours
Urea	..	25·0-35·0
Creatine	..	0·0-0·06
Creatinine	..	1·2-1·7
Amino Acids	..	0·2-0·4
Hippuric Acid	..	0·1-1·0
Sodium	..	3·0-5·0
Potassium	..	1·5-2·5
Calcium	..	0·1-0 [illegible]
Magnesium	..	0·1-0·3
Iron	..	0·1-0·2

	Grams per 24 hours
Chloride ..	10·0-15·0
Iodine ("Hormonal")	
Adult ..	20-70 gamma
Child ..	20-35 gamma
Sulfur, Total ..	2·0-3·4
Phosphate ..	2·5-3·5
Urobilin ..	0·01-0·13
Vital capacity male ..	4000-5000 cc.
Female ..	2000-4000 cc.
Basal Metabolic Rate ..	10% of mean standard

Normal Cerebrospinal fluid values

Protein	Less than 40 mg./100 c.c.
Chloride	450 mg./100 c.c.
Sugar	40-60 mg./100 c.c.
Pressure	100-200 mm. of water

Liver function tests

Brom Sulfalein test (5mg./Kg.)	No dye in blood after 45 minutes
Hippuric acid test (oral)	6 Gm. Benzoic acid; 4-6 Gm. of Hippuric acid excreted in 4 hours
Hippuric acid test (I.V.)	0·7-1·5 Gm. Hippuric acid exerted in 1 hour
Bilirubin excretion test	0-5% retention in 4 hours in normal individuals
Cephalin Cholesterol Flocculation test	0
Icteric index	4-6 units
17 Ketosteroids male	8-21 mg. excreted in urine per 24 hours
female	4-14 mg. excreted in urine per 24 hours

Abbreviations and Symbols

Abbreviations	*Meaning*
B M R	Basal Metabolism Rate
b d. (or b.i.d.)	Twice a day
B P.	Blood pressure
C.B C.	Complete Blood Count
C.C.	Cubic Centimeter
C.M.	Centimeter

Normal blood chemistry values:

	Constituent	*Value/100 cc.*	*mEq /Liter*
Serum or Plasma	Sodium	310-340 mg.	136-145
	Chloride	350-375 mg.	100-106
	Total Chlorides	580-620 mg.	100-106
	Potassium	14-20 mg.	3·5-5·0
	Phosphorus	3-4·5 mg.	0·9-1·5 (mM)
	Magnesium	1-3 mg.	1-2
	Calcium, Total	9-11 mg.	4·5-5·5
	CO_2 Combining Power	55-75 Vol. %	24-28
	Cholesterol	150-240 mg.	
	Amylase	80-180 Units	
	Phosphatase, alkaline	2·0-4·5 Units (Bodansky)	
	Phosphatase, acid	0·5-2 Units (Bodansky)	
	Protein Bound Iodine	4-8 micrograms	
	Serum Albumin	4·5-5·5 Gm.	Total: 6·0-8·0 Gm. per 100 cc.
	Serum Globulin	1·5-3·0 Gm.	
	Fibrinogen (plasma)	0·2-0·6 Gm.	
	Albumin. Globulin Ratio	$\frac{A}{G} = \frac{2}{1} = \frac{4\cdot5 \text{ Gms/100 c.c.}}{2\cdot5 \text{ Gms/100 c.c.}}$	
Blood	*Glucose*	*80-120* mg. (Folin-Wu)	
	Total Non-Protein Nitrogen	15-35 mg/100 cc.	
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	Uric Acid	3-6 mg/100 cc	
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pH	4·8-7·8
	Grams per 24 hours
Urea	25·0-35·0
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Amino Acids	0·2-0·4
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Sodium	3·0-5·0
Potassium	1·5-2·5
Calcium	0·1-0·3
Magnesium	0·1-0·3
Iron	0·1-0·2

		Grams per 24 hours
Chloride	..	[illegible]
Iodine ("Hormonal")		
Adult	..	[illegible] gammas
Child	..	[illegible] gammas
Sulfur, Total	..	[illegible]
Phosphate	..	[illegible]
Urobilin	..	[illegible]
Vital capacity male	..	[illegible] cc
Female	..	[illegible] cc
Basal Metabolic Rate	..	10% of mean standard

Normal Cerebrospinal fluid values

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C.B.C.	Complete Blood Count
C.C.	Cubic Centimeter
C.M.	Centimeter

Abbreviations	*Meaning*
C.N.S.	Central Nervous System
C.S.F.	Cerebro-spinal fluid
E.C.G.	Electro-cardiogram
E.E.G.	Electro-Encephalogram
E.S.R.	Erythrocyte sedimentation rate
G.B.	Gall Bladder
G.I.	Gastro-Intestinal
G.M.	Gram
Gr.	Grain
G.U.	Genito-Urinary
H.B.	Haemoglobin
I.M.	Intra-Muscularly
I.U.	International Unit
I.V.	Intra-venously
I.V.P.	Intravenous Pyelogram
K.G.	Kilogram
lb.	pound
Lab.	Laboratory
L.P.	Lumbar puncture
M.Eq.	Milliequivalent
mg.	milligram
M.L.	Millilitre
Min.	Minim
N.P.N.	Non-protein nitrogen
O.R.	Operating Room
P.S.P.	Phenon Sulphonphthalein
Pre-op.	Before operation
Post-op	After operation
R.B.C.	Red Blood Corpuscle
Sol.	Solution
sp gr.	specific gravity
t.d. (or t.i.d.)	Three times a day
T.B.	Tuberculosis
W.B.C.	White Blood Corpuscle

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